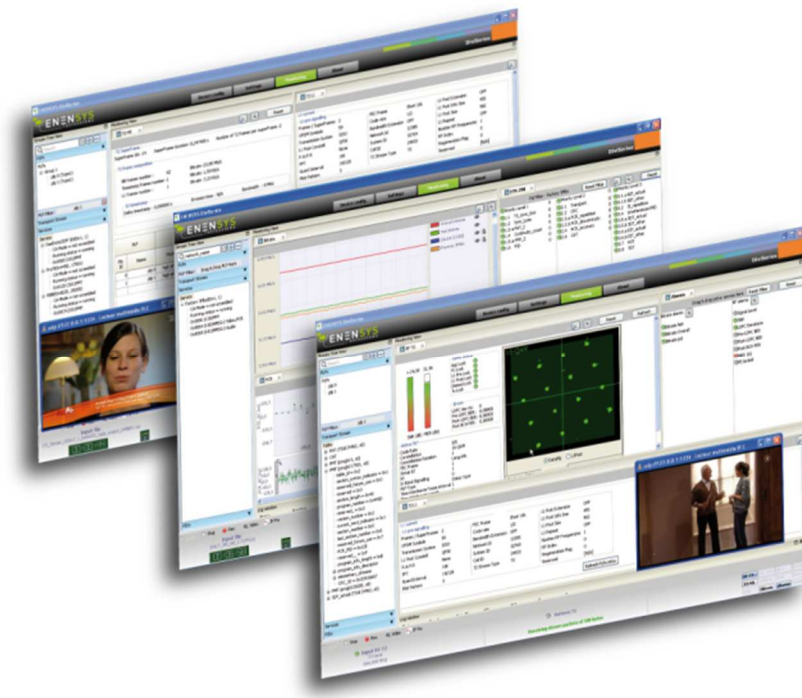


DiviSuite



User Manual DiviSuite 2.3

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1 Introduction

This User Manual applies for DiviSuite 2.3 software. This manual includes general information about DiviSuite software, installation instructions and operating instructions.

1.1 Product Overview

DiviSuite software is ENENSYS TESTSYSTEMS' analysis tool for Digital TV signals, from RF down to Video. It provides analysis and monitoring of **RF and baseband signals** and supports **MPEG-2 TS, DVB, ATSC** and **ISDB** standards. It also features real-time transport stream capture functionalities, offline (file-based transport stream) analysis as well as video decoding.

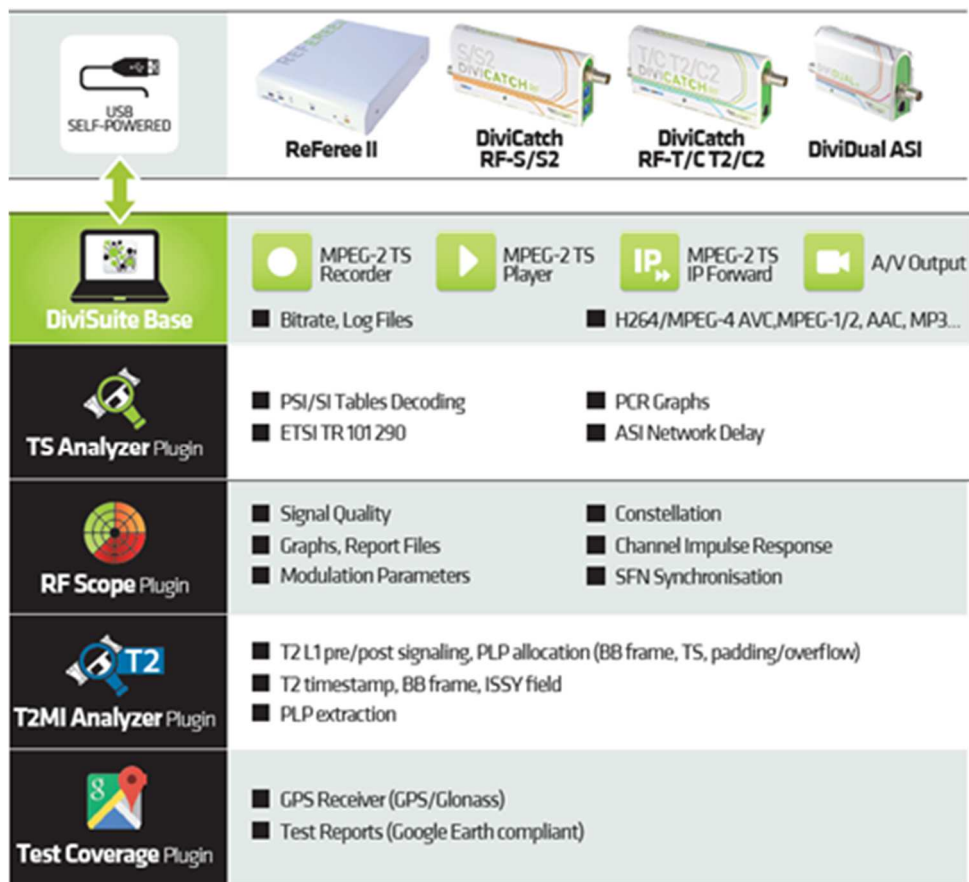
In order to receive the Digital TV input signal, the PC running the DiviSuite needs to be connected to an ENENSYS TESTSYSTEMS' USB adapter. Depending on the type of this device, different input interfaces and standards can be managed:

- RF, ASI, IP, File input interfaces
- DVB-T2, DVB-T, DVB-C2, DVB-C, DTMB, ATSC, ISDB-T, MPEG-2 TS, DVB T2-MI standards...

Please, refer to §2.6 for a list of available devices.

DiviSuite provides the **DiviSuite Base** analysis functions, which can be enhanced by software **plugin** activation. Available analysis functions are:

- **DiviSuite Base:** MPEG-2 TS recording to file, MPEG-2 TS file playback to ASI output, MPEG-2 TS forward over IP output, MPEG-2 TS Audio/Video decoding, MPEG-2 TS PID view and bitrate monitoring, log files.
- **RF monitoring (RF Scope plugin):** signal level, SNR, MER, constellation diagram, Channel Impulse Response graphs.
- **MPEG-2 TS analysis (TS Analyzer plugin):** ETSI TR 101 290 Priority 1, 2, 3, PCR accuracy graphs.
- **T2-MI analysis (T2MI Analyzer Plugin):** T2 L1 pre/post signaling, single & multi PLP, T2 timestamp, BB frame...
- **Test Coverage plugin:** Google Earth compliant coverage report files, containing RF measures values and GPS localization information.



1.2 PC/Laptop minimum requirements

In order to ensure best performances, DiviSuite should be installed on a computer with at least a Dual-Core processor, 2GHz and 1GB of RAM.

The ENENSYS TESTSYSTEMS devices connected to the PC are powered by via the USB adapter. The USB adapter should be plugged to the PC's USB power connector.

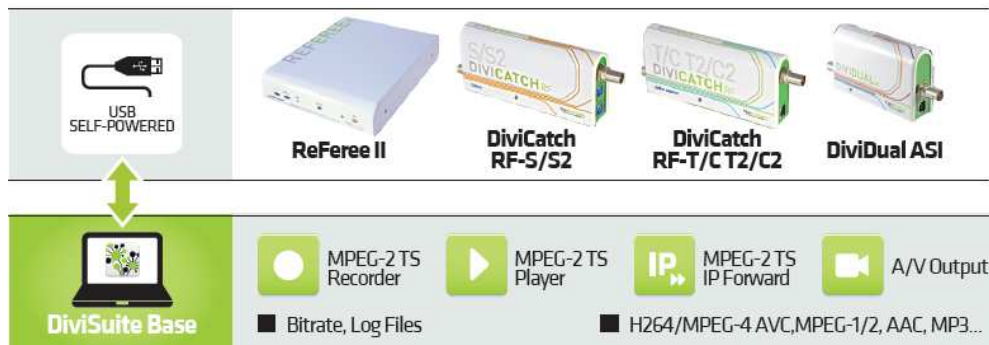
If using a portable computer, the energy saving mode must be disabled. The energy saving mode can limit the USB power of the connected device. This can cause the analysis degradation, especially for the Divi devices which are equipped with an auxiliary USB power connector, and which need more power to operate than the Divi devices equipped with a single USB connection.

2 Product Features

2.1 DiviSuite Base

DiviSuite Base allows reception of a Digital TV stream (RF or baseband) through the physical adapter's interfaces: RF, ASI or IP. The corresponding MPEG-2 TS can be recorded in real-time in a file for offline playout. DiviSuite Base also allows monitoring of PIDs' bitrate. Alarm management as well as log file management are embedded.

DiviSuite Base integrates a video decoder enabling real-time decoding of all unencrypted services (H.265/HEVC, H.264/MPEG-4 AVC, MPEG-1/2, AAC, MP3...).



DiviSuite Base analysis functions can be enhanced through the activation of plugins:

- RF Scope: RF Signal Quality monitoring
- TS Analyzer: MPEG-2 TS analysis
- T2MI Analyzer: DVB T2-MI analysis
- Test Coverage: coverage report files compatible with Google Earth application.

2.2 RF Scope Plugin

RF Scope plugin is the RF Signal Quality Monitoring feature of DiviSuite. It allows monitoring, in real-time, the RF parameters of the incoming signal¹:

- Demodulation status (front end lock ...)
- Signal Level, SNR (signal to noise ration), MER (Modulation Error Rate)
- Impulse Response (echoes) in DVB-T/T2/C/C2
- Constellation graph in DVB-T/T2/C/C2
- Error rates: LDPC iteration and BCH BER in DVB-T2/C2, Viterbi and RS in DVB-T/C, BER in DVB-S, PER in DVB-S2
- Modulation parameters: L1 signaling in DVB-T2/C2 (PLP modulations parameters, ...), TPS information in DVB-T

DiviSuite Base allows the reception of RF signals even if the RF Scope plugin is not activated. In the absence of the RF Scope plugin, the signal quality measures are not available.



¹ Available RF parameters and accuracy of the measurements depend on the RF adapter used, not on the DiviSuite software. Please, refer to your RF adapter datasheet for more information.

2.3 TS Analyzer Plugin

The TS Analyzer plugin is the analysis tool for MPEG-2 Transport Stream. TS Analyzer plugin allows parsing the stream content by decoding PSI/SI tables, in addition to the PID parsing feature of the DiviSuite Base IP.

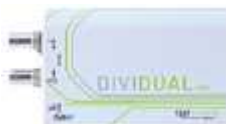
Table parsing supports all standard based on MPEG-2 TS: raw MPEG-2 TS (PAT, PMT), DVB, ATSC and ISDB. It also features private tables and section decoding through configurable scripts.

TS Analyzer plugin also provides ETSI TR 101 290² priority 1, 2, 3 (ETR290) consistency check of the MPEG-2 TS. It features configurable alarms (parameter alarm activation and threshold) that can be logged. PCR accuracy measurements are also available, providing real-time display of the delay as well as history graph. All ETR290 analysis can be done on specific PID or a service.



- PSI/SI Tables Decoding
- ETSI TR 101 290

- PCR Graphs
- ASI Network Delay



2.4 T2MI Analyzer Plugin

T2-MI Analyzer plugin is the analysis tool for DVB-T2 Modulator Interface monitoring. It supports T2-MI Single and Multi-PLP streams. It allows real-time monitoring of DVB-T2 parameters and de multiplexing of PLP contents. These contents can then be analyzed in real-time with TS Analyzer plugin, decoded and displayed...

T2-MI monitoring features:

- T2 L1 pre/post signaling: frame, cells, OFDM symbols, # FEC, interleaving, TI block size
- PLP allocation: BB frame padding, TS padding, TS overflow
- BB frame, ISSY field, T2 timestamp

DiviSuite Base allows the reception of T2-MI streams even if the T2MI Analyzer plugin is not activated. In the absence of the T2MI Analyzer plugin, the different PLPs are not extracted nor analyzed. However, the corresponding MPEG-2 TS can be recorded.



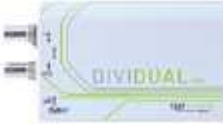
T2MI Analyzer

- T2 L1 pre/post signaling, PLP allocation (BB frame, TS, padding/overflow)
- T2 timestamp, BB frame, ISSY field
- Single & Multi-PLP, PLP extraction

NEW









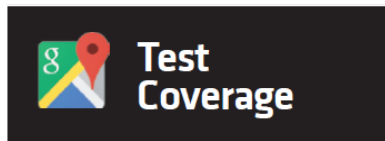


2.5 Test Coverage Plugin

Test Coverage plugin can be used only by the DiviSuite application connected to a ReFeree II device.

Test Coverage plugin allows to activate the embedded GPS receiver in order to generate test report files (KML, readable with Google Earth). These files contain the measured values for the configured parameters as well as the localization information (GPS/Glonass).

The plugin is delivered with a magnet GPS L1 Antenna.

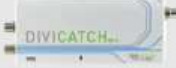


- GPS Receiver (GPS/Glonass)
- Test Reports (Google Earth compliant)



2.6 Supported Devices

The table below indicates which ENENSYS TESTSYSTEMS's devices are supported by the DiviSuite software. It also indicates which plugins are compatible with these devices.

 LIGHTWEIGHT DEVICES  USB SELF-POWERED  DIVISUITE			STANDARDS	CHARACTERISTICS							PLUGINS				
				RF Input RF	ASI Input/Output ASI	IP Input/Output IP	SPI Input/Output SPI	1 PPS & 10 MHz Input TTL	GPS Input GPS	A/V Output Recorder Player	RF Scope TS Analyzer T2MI Analyzer Test Coverage				
Measurement Receivers															
 ReFree II				DVB-T T2 Lite DVB-C ISDB-T	•	•	•		•	•	• (1)	•	•	•	•
Professional Receivers															
 DiviCatch RF-S/S2				DVB-S DVB-S2	•	•	• (2)			•	•	• (1)	•	•	•
 DiviCatch RF-T/C T2/C2				DVB-T T2 Lite DVB-C ITU-J83 Annexes A, C	•	•	• (2)			•	•	• (1)	•	•	•
 DiviCatch RF ISDB-T/Tb				ISDB-T ISDB-Tb	•	•	• (2)			•	•	• (1)	•	•	•
 DiviCatch RF-C				DVB-C ITU-J83 Annexes A, B, C	•	•	• (2)			•	•		•	•	•
Baseband Adapters															
 DiviDual T2MI				Baseband DVB-T T2 Lite	•	• (2)				•	•	•	•	•	
 DiviDual ASI				Baseband DVB-T T2 Lite DVB-C DVB-S DVB-S2	•	• (2)				•	•	•	•	•	
 DiviDual ASI+SPI LVDS or TTL				ISDB-T ATSC DTMB	•	• (2)	•			•	•	•	•	•	
 DiviDual ETI				Baseband DAB, DAB+ T-DMB	•						•	•			
 DiviSuite IP				Pure Software (Fixed PC license, Floating server license) 											

3 Installing DiviSuite

3.1 Software installation

3.1.1 DiviSuite installer

The software for installing the DiviSuite is stored on the USB key delivered with your ENENSYS TESTSYSTEMS device, in the "Software" directory.

You can also download the latest release from the ENENSYS TESTSYSTEMS Privileged Area website (<http://privileged.enensys.com>). ENENSYS TESTSYSTEMS releases on its Privileged Area product updates which include new features.

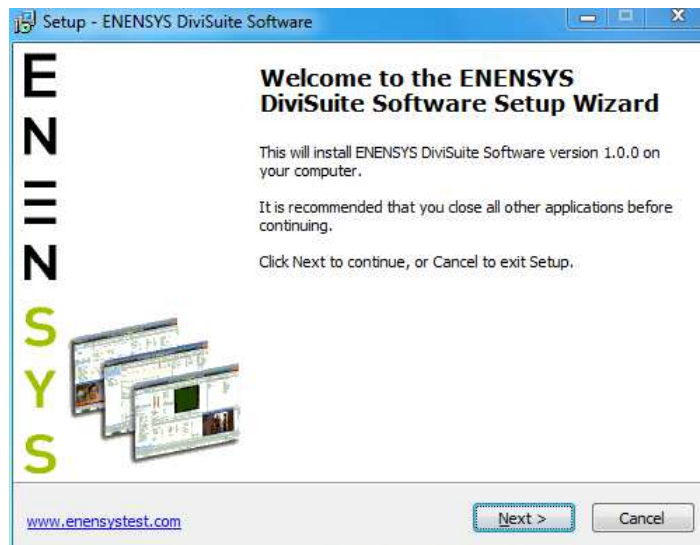
The DiviSuite software supports Windows XP, Windows Vista, Windows 7 and Windows 8 operating systems, in 32 and 64 bits.

3.1.2 Installation

Before proceeding with installation:

- Please ensure that no ENENSYS TESTSYSTEMS USB device is connected to your computer
- If you already have ENENSYS TESTSYSTEMS' devices that are not supported by the DiviSuite software, you must first install the software for those devices.

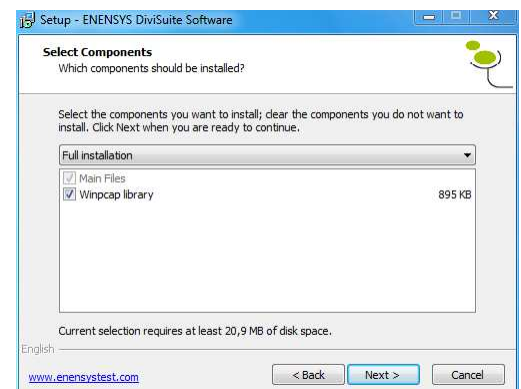
Launch the installer executable. This will display the following window:



DiviSuite installation process uses common Windows installation process. The following instruction details only specific screens. For other screens, please, follow the on screen instruction.

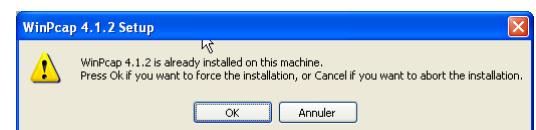
Select Components

Select "Full installation". Keep WinPcap library component. It is needed for IP input management. This will install WinPcap 4.1.2 version.



WinPcap 4.1.2 Setup:

If WinPcap 4.1.2 is already installed on your computer, you can cancel the installation. Else proceed with WinPcap installation



WinPcap 4.1.2 Setup:

WinPcap Installation: keep default values proposed by the installer.



ENENSYS 64 bits Driver Installation:

*This applies only to 64bits operating systems, not to 32bits.
Proceed with on screen instructions for installation.*



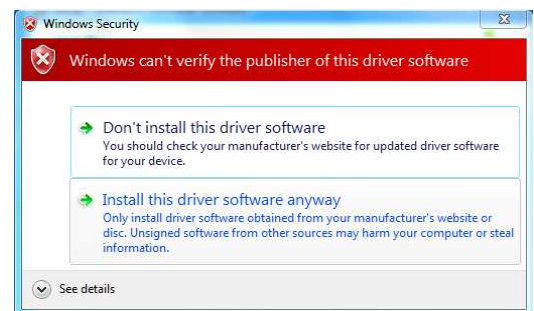
ENENSYS 64 bits Driver Installation:

*This applies only to 64bits operating systems, not to 32bits.
Accept installation by clicking "Install".*



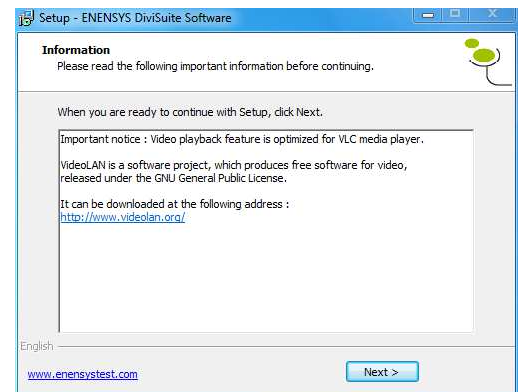
ENENSYS Driver Installation:

If operating system ask for a confirmation on installing ENENSYS driver software, select "Install this software anyway"



VideoLAN installation:

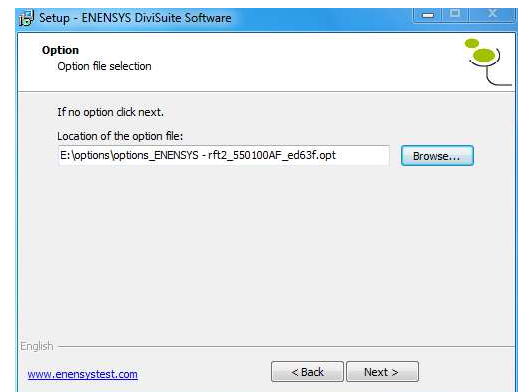
DiviSuite relies on VLC software for content decoding. It is necessary to install the latest release of this software. Follow the link provided in the Setup windows to proceed with VLC download and installation.



Plugin activation file selection:

If you have ordered plugins before delivery, the plugin activation file is provided to you in the USB key content, in the \options directory. It may also have been sent by email if ordered after delivery of the device. This setup window allows importing the activation file before starting the DiviSuite application.

If you do not want to import an activation file, press "Next" to proceed with next step.



3.2 Plugin activation

Plugin activation can be done at install time (refer to §3.1.2). However, you may also proceed with plugin activation after having installed the application. This will be detailed later in this manual in §5.9.3.

3.3 Calibration File activation

If applicable to the device, calibration file installation should be done after the installation of the application. This will be detailed later in this manual in §5.9.4.

3.4 Connect your device

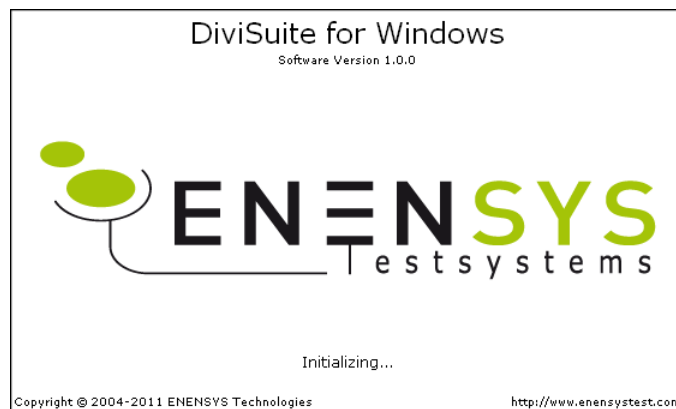
DiviSuite software is now installed on your computer; you can now connect your ENENSYS TESTSYSTEMS' device. Please, refer to the User Manual of your device for instructions.

4 Starting DiviSuite

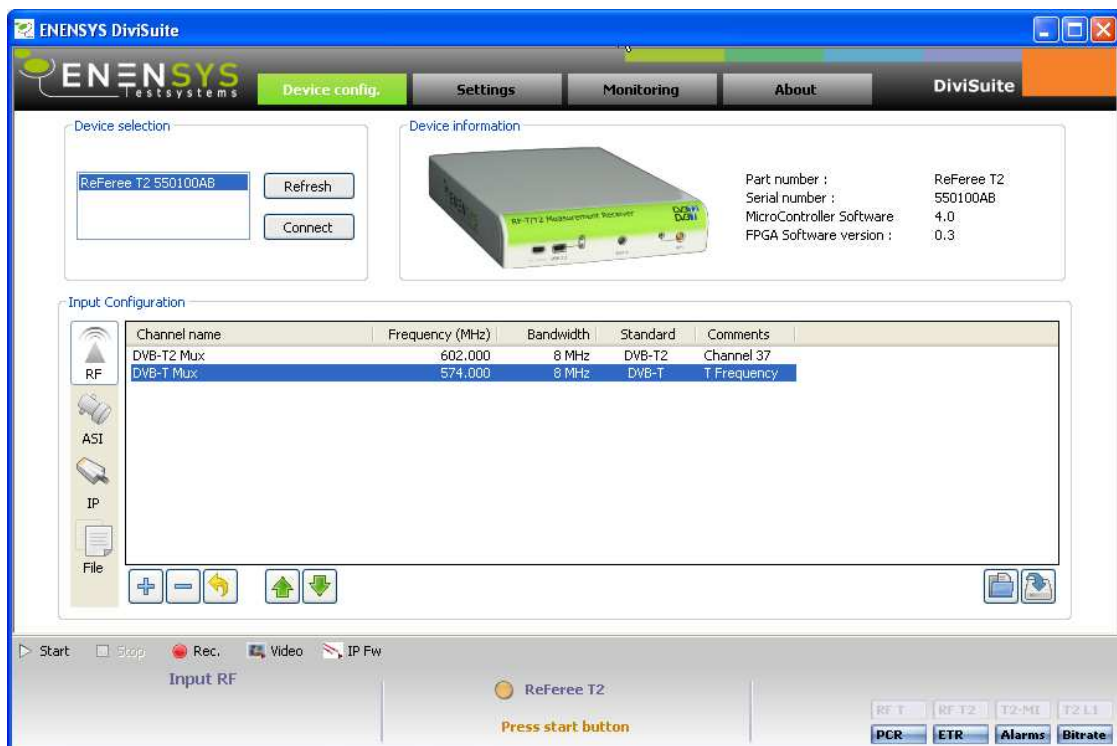
4.1 DiviSuite startup

To launch DiviSuite, double click on the icon created on your desktop at installation or click on the "Start Menu\ENENSYS\DiviSuite\DiviSuite 2.1" shortcut in the start menu of Windows also created at installation.

During application startup, the following splash screen is displayed.



Once started, the DiviSuite window appears:

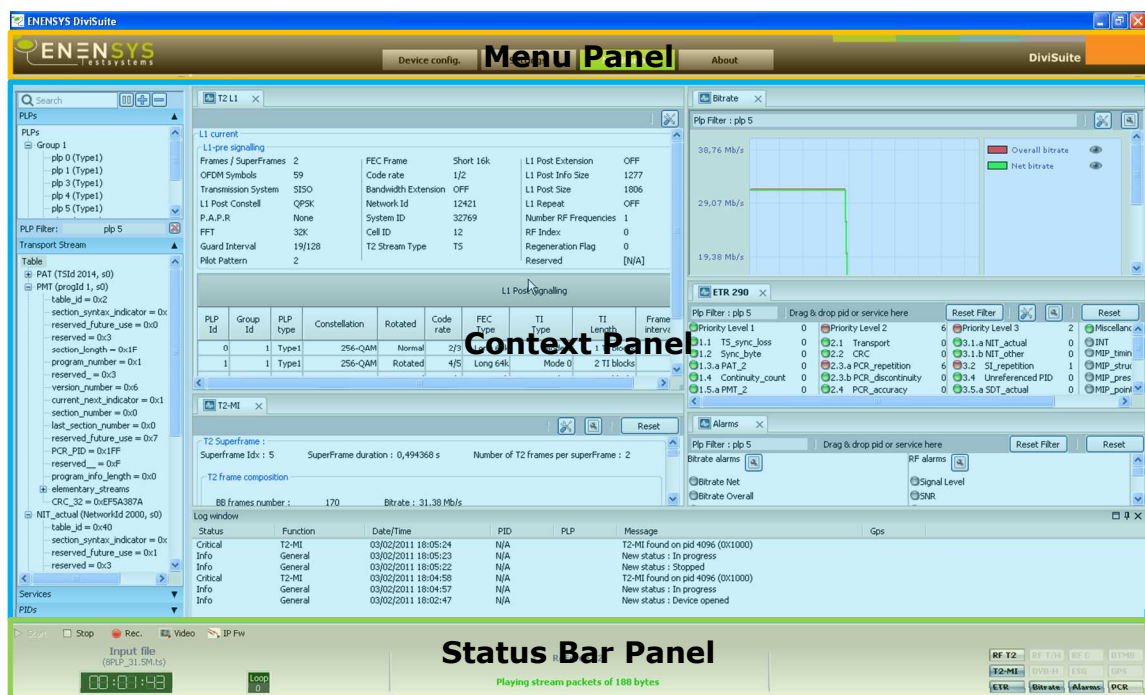


5 DiviSuite Basic GUI

5.1 DiviSuite main window

The graphical interface of DiviSuite is organized in three main panels:

- **Menu panel:** this panel contains menu items to select the content displayed in the Context Panel. This panel is always visible.
- **Context panel:** this panel can change depending on the Menu Panel. It allows accessing to configuration and analysis features of the DiviSuite application.
- **Status Bar panel:** this panel contains control and status of the analysis features. It also contains controls for visible views of the Context panel. It is always visible.



5.2 Menu Panel

The Menu panel contains four menu buttons which allow selecting the current view in the Context panel:

- "Device config.": allows selection and configuration of the ENENSYS TEST-SYSTEMS' device and its operation mode.
- "Settings": allows configuration of DiviSuite Basic and plugins features.
- "Monitoring": displays the monitoring views of the current analysis.
- "About": general information about DiviSuite and plugin (including plugin activation).



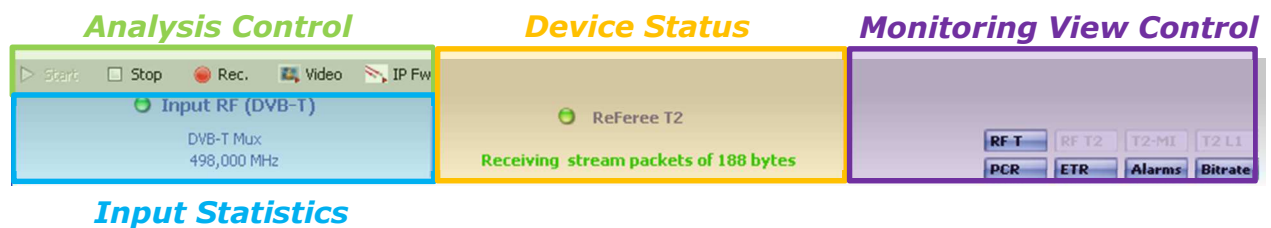
The selected view in the Context panel appears highlighted in green, "Device Config." View in the example.

5.3 Status Bar Panel

The Status Bar features control of the current analysis, status on the current input and selected device and control of the monitoring view.

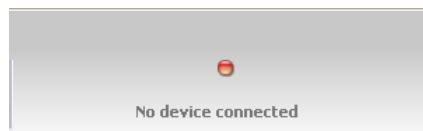
It is composed of four different areas:

- Analysis Controls
- Input Statistics
- Device Status
- Monitoring View Controls



5.4 Status Bar Panel: Device Status

The Device Status gives information on current connected device and its state. It is composed of a status LED, device name and status on current input. The different states are given below.



State:

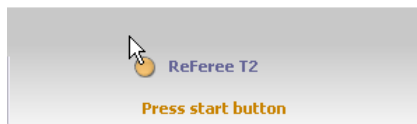
- No device connected
- Status LED is RED

Meaning:

- No device is connected to the computer or no device is connected to the DiviSuite

Corrective action:

- Connect your device to a USB port of the computer
- Go to Device Configuration and connect DiviSuite to the device



State:

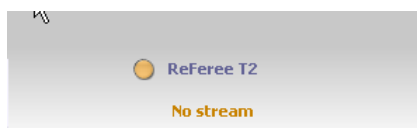
- Device connected (name reported)
- Status LED is Orange

Meaning:

- A device is connected but no analysis has been started

Corrective action:

- Start the analysis



State:

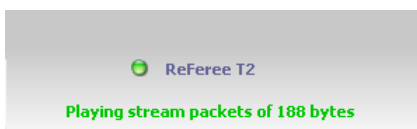
- Status LED is Orange blinking
- A device is connected (name reported), analysis is started but no stream is received

Meaning:

- Although the analysis is started, no valid incoming stream is detected

Corrective action:

- Check connection of the device to the input source equipment
- Check input configuration parameters (RF channel, IP address...)
- Check input source signal validity



State:

- Status LED is Green blinking
- A device is connected (name reported), analysis is started and stream is received

Meaning:

- Analysis is running

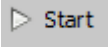
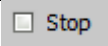
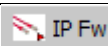
5.5 Status Bar Panel: Analysis Controls

5.5.1 Overview

The analysis and playback controls allows controlling the current analysis. A device must be connected to the DiviSuite software to make these controls active.

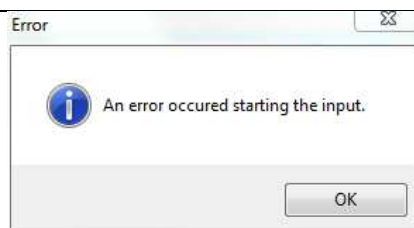


It features:

	Input start	It is used to start analysis or playback on the current input; refer to device configuration description for detailed information on input configuration.
	Input stop	It is used to stop current analysis or playback.
	Input stream recording	It is used to record the current input stream in a file for offline analysis.
	Video display	It is used to decode and display video content using VLC player.
	IP Forward	It is used to forward the input stream to an IP address (for example towards a professional receiver)

5.5.2 Input start

In order to be able to start reception of input stream, an input must be selected and configured (refer to §5.10.4 for information on input configuration). To stop an analysis, click on the Stop button. If input channel is not selected or misconfigured, the following error is displayed:



RF input is selected but no RF channel is selected

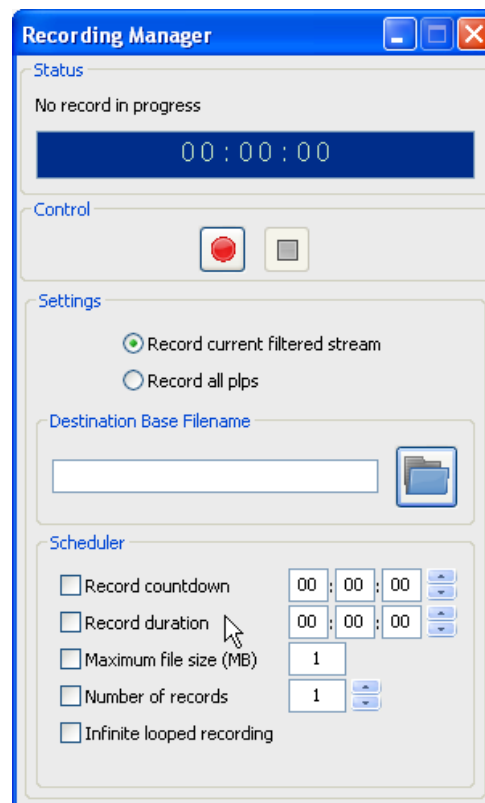
5.5.3 Record input stream

DiviSuite allows recording the input stream:

- In the case of RF DVB-T2 input, the incoming stream is the selected PLP (refer to §5.12.2 for information on selecting a PLP).
- In the case of RF DVB-T input, the incoming stream is the selected hierarchical mode (refer to §5.12.3 for information on selecting a hierarchical mode)
- In the case of **MPEG-2 TS input**, the incoming content is the MPEG-2 TS stream.
- In the case of **T2-MI input**, the content can be selected **to record either the selected PLP content or the full T2-MI content**.
 - o To select a specific PLP, select the PLP in the Stream Tree View as described in §5.12.2.
 - o To select the whole T2-MI stream, no PLP filtering should be done in Stream Tree View as described in §5.12.2.

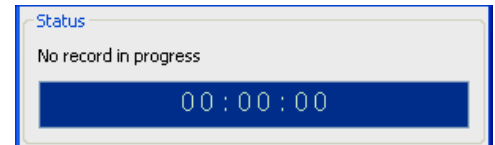
When starting **Input Stream Recording**, the window shown below is displayed. During recording, it can be closed without stopping recording. Click again on Record in Status Bar Panel to show again the window.

Input stream recording can be started before analysis is started. It is also possible to start and stop analysis while recording. In this case, recording will be suspended until analysis is restarted.



Status

- o Give information on current recording (time elapsed, file size)



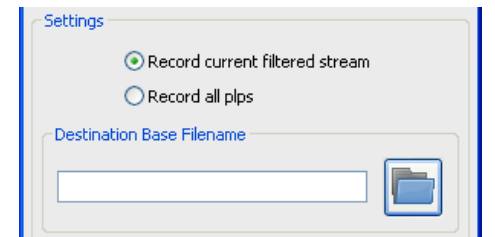
Control

- o **Start**  or **stop**  recording



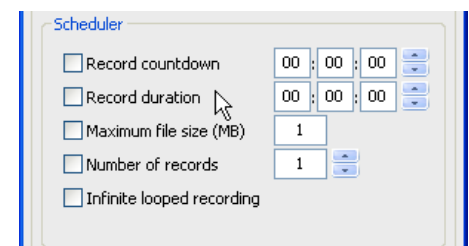
Settings

- o **Record current filtered stream / Record all plps**
 - Record current filtered stream: in the case of DVB-T2 T2-MI, record the content of active PLP or complete T2-MI stream
 - Record all plps: in the case of DVB-T2 T2-MI, record content from all PLP in separate files.
 - No meaning in other cases (RF DVB-T2 record current PLP; other standard than DVB-T2 record MPEG-2 TS standard)
- o **Destination Base Filename:** base name of the recorded file. Final file name will be:
 $\{Destination\ Base\ Filename\}_{\_}\{index\}.ts$
 Where {index} is a number indicating the file index.
 Already existing files are not replaced. Instead, an index is incremented.



Scheduler

- o **Record countdown:** check if a time countdown is needed before starting recording. Use input on its right to setup time countdown. This apply to complete recording process, this means that if multiple record are used, countdown will be done once, before the first record starts.
- o **Record duration:** check if you want to limit recording to a specific duration. Use input on its right to setup recording duration.
- o **Maximum file size:** check if you want to limit the file size to a specific size. Use input on its right to setup maximum file size in Mbytes
- o **Number of records:** check if you want to record multiple files. A new record will be created each time Record duration is elapsed and/or each time Maximum file size is reached.
- **Infinite looped recording:** repeat infinitely the recording, with all settings except countdown done once, until recording is manually stopped.



5.5.4 Video display

Starting video display will show the Video Output Manager window. Video display uses VLC media player. During video display, the Video Output Manager window can be closed without stopping video display. Click again on Video display in Status Bar Panel to show again the window.

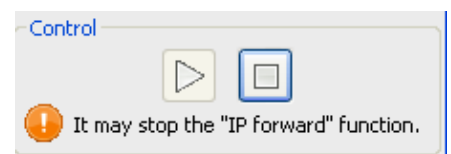
In the case of multiple PLPs, the content displayed will be the selected PLP (refer to §5.12.2 for information on selecting a PLP). Selected PLP can be changed and video displayed will be automatically updated.

Note: Connection between the DiviSuite and VLC player is done through a UDP connection (local host address, UDP port configurable). This connection is shared with IP Forward function and thus may interfere with it if IP Forward IP address is different from local host or UDP port is different.



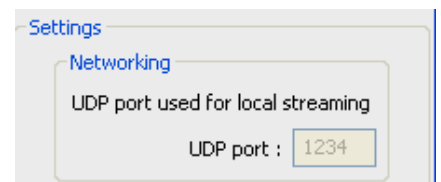
Control

- o Start  or Stop  VLC player



Control

- o UDP port used for local streaming: VLC reads the video content from a localhost UDP connection. The UDP port can be configured to prevent from collision with other softwares.



Starting Video Display will launch VLC media player. Please refer to VLC User Manual for more information.



5.5.5 IP Forward

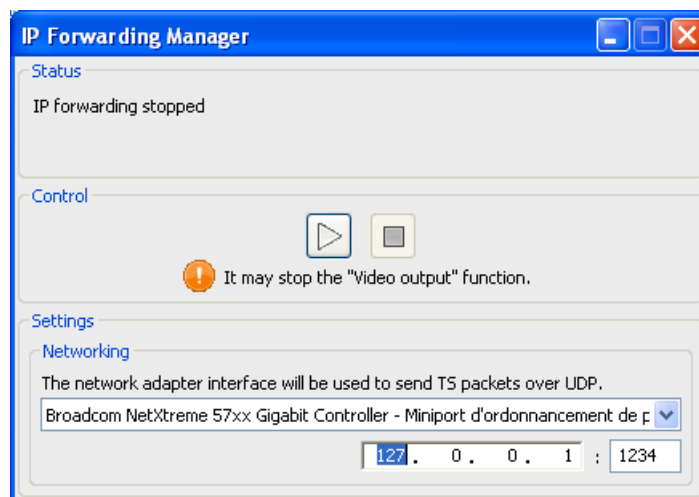
IP Forward can be used to send the input stream content towards remote equipment through your IP network. It supports unicast or multicast transmission. Content is broadcasted in MPEG-2 TS over UDP format. The Ethernet controller used is one of the computer's controllers.

Starting IP Forward will show the IP Forwarding Manager window. During IP Forward, the IP Forwarding Manager window can be closed without stopping IP forward. Click again on IP Forward in Status Bar Panel to show again the window.

In the case of multiple PLPs, the content forwarded to IP will be the selected PLP (refer to §5.12.2 for information on selecting a PLP). Selected PLP can be changed and forwarded content will be automatically updated.

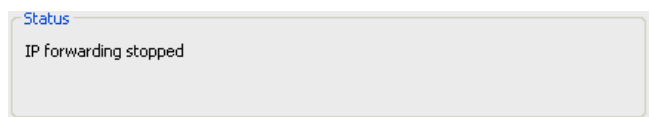
- o In the case of a T2-MI input stream, either a specific PLP, either the complete T2-MI stream can be forwarded to IP. To select the whole T2-MI stream, no PLP filtering should be done in Stream Tree View as described in §5.12.2.

Note: IP Forward function is shared with Video Display function and thus may interfere with it if IP address is different from local host or UDP port is different.



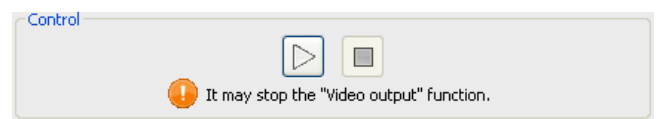
Status

- o Indicates if IP Forwarding is currently stopped or started.



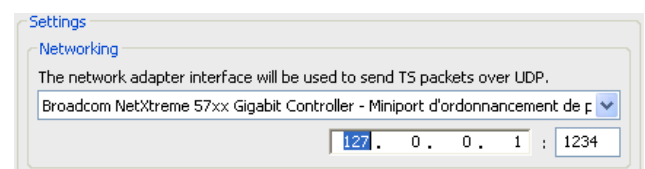
Control

- o Start  or Stop  IP Forwarding



Settings

- o Network adapter: select the Ethernet controller of the computer through which the IP Forward will send datas
- o IP address and port: identify the destination equipment. IP address could be unicast or multicast.



5.6 Input Statistics

Input statistics displays information about the current input stream. It depends on the input type. Each case is detailed below.

	RF Input: - o The LED indicates the state of the RF front end. Green means locked (signal found), RED means unlock. - o Indicates the channel name as defined in channel list of Device Configuration panel, as well as RF frequency and standard.
	ASI Input: o Indicates the ASI input is in use.
	IP Input: o Indicates the IP stream name as defined in channel list of Device Configuration panel, as well as IP address and UDP port.
	File Input: - o Indicates the current played file - o Indicates the elapsed time in the file (HH:MM:SS) as well as loop count (how many times the file list has been played).

5.7 Monitoring View Control

Monitoring View Control allows showing or hiding monitoring views of the Context Panel.



Note: Hiding or showing analysis view does not mean starting or stopping an analysis. This one continues to be ran in background even if its monitoring view is hidden.

Controls of this area have different states depending on conditions listed below. These states are applicable to other controls.

	The analysis is enabled and its view is displayed in the Monitoring View
	The analysis is enabled but its view is not displayed in the Monitoring View
	The analysis is disabled

There are three reasons for a disabled analysis:

- The analysis is not supported by the connected device.
 - Contact ENENSYS TESTSYSTEMS team for information on devices supporting this analysis.
- The analysis is part of a plugin and the plugin has not been activated.
 - Validate that the plugin has been activated.
- The analysis has been disabled in the Setting panel.
 - Go to settings panel and enable the analysis.

The available controls are

	RF Scope in DVB-T2 Monitoring View, needs RF Scope plugin
	RF Scope in DVB-T Monitoring View, needs RF Scope plugin
	T2 L1 Analysis in DVB-T2 Monitoring View, needs RF Scope plugin
	T2MI Monitoring View, needs T2MI plugin
	RF Scope in DVB-C Monitoring View, needs RF Scope plugin
	RF Scope in DVB-C2 Monitoring View, needs RF Scope plugin

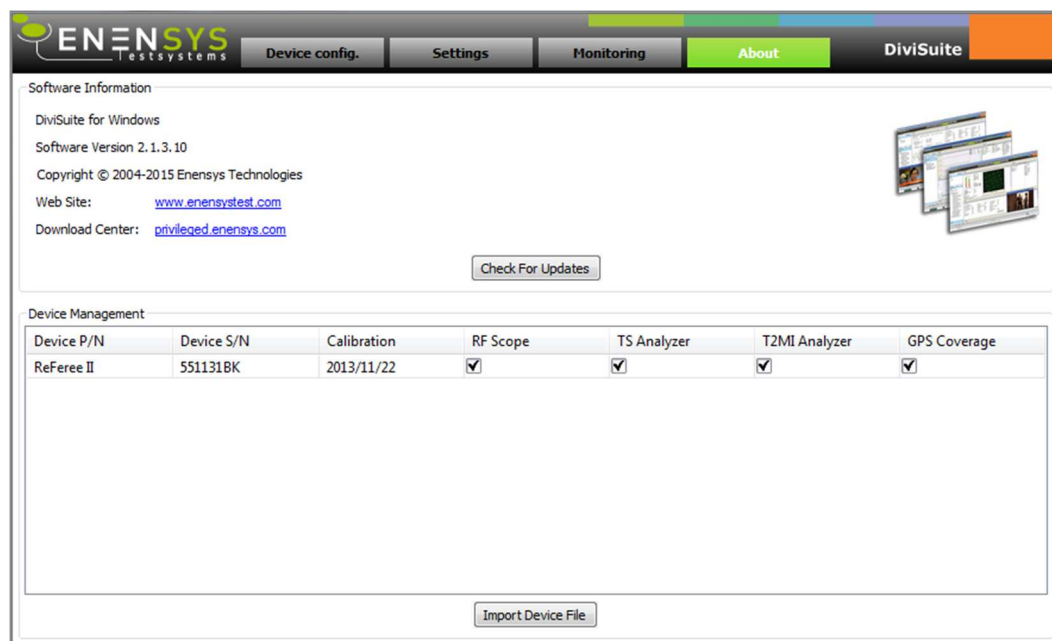
	C2 L1 Analysis in DVB-C2 Monitoring View, needs RF Scope plugin
	RF Scope in DVB-S2 Monitoring View, needs RF Scope plugin
	RF Scope in DVB-S Monitoring View, needs RF Scope plugin
	ETR 290 Monitoring View, needs TS Analyzer plugin
	PCR Monitoring View, needs TS Analyzer plugin
	Bitrate Monitoring View, included in DiviSuite Basic
	Alarms Monitoring View, included in DiviSuite Basic
	Delay View (SFN Delay DVB-T/T2, ASI Delay DVB-T), needs RF Scope plugin for RF input analysis, TS Analyzer for ASI input analysis
	GPS Monitoring View, needs Test Coverage plugin

5.8 Context Panel

The content of this panel depends on the selected menu in Menu Panel: Device Configuration, Settings, Monitoring and About views. The following chapters describe the content of those views of the DiviSuite Basic software. Dedicated chapters are also available in this manual for specifics views of each plugin.

5.9 Context View: About

This view provides information about the software version of the installed DiviSuite software. It also gives access to the plugins information and activation.



5.9.1 Software Information

It contains information on the application and ENESYS TESTSYSTEMS contact.

- **Software Version:** indicates the version of the installed application.
- **Web Site:** click on the link to open a browser window on the ENESYS TESTSYSTEMS website.
- **Download Center:** click on the link to open a browser window on the ENESYS TESTSYSTEMS privileged area. You will find there information on the current release of the products, datasheet, manuals and software revision. You need to register on this website to gain full access. It is highly recommended by ENESYS TESTSYSTEMS support team to ensure you will have information on latest release.
- **Check For Updates:** when you click on this button, the application will check if a newer revision exists for the DiviSuite application. If this is the case, it will propose you to install it.

5.9.2 Device Management

It contains information on the option files and calibration files already registered with your application.

For example, the following information means:

Device P/N	Device S/N	Calibration	RF Scope	TS Analyzer	T2MI Analyzer	GPS Coverage
ReFeree II	551131BK	2013/11/22	☒	☒	☒	☒

- ReFeree II S/N 551131BK is registered
 - o With RFScope, TS Analyzer, T2MI Analyzer and Test Coverage plugins enabled.
 - o A calibration file, generated on November the 22nd of 2013 has also been provided.

5.9.3 Plugin activation

Each plugin is activated for a specific device and is available only for this device³.

To activate a plugin, click on the Import button and select the plugin activation file provided by ENENSYS TESTSYSTEMS. Application will then be restarted in order to activate the new plugins.

5.9.4 Calibration activation

Each calibration file is activated for a specific device and is available only for this device¹.

To import a calibration file, click on the Import button and select the calibration file provided by ENENSYS TESTSYSTEMS. Application will then be restarted in order to activate the calibration.

³ DiviSuite can be installed on multiple computers. It is then necessary to activate plugins and calibration for a specific device on all these computers to be able to use the device on each computer.

5.10 Device Config View

5.10.1 Overview

The device configuration view allows:

- Selection and connection to a device
- Selection and configuration of the inputs of the device

When launching the DiviSuite software without a connected device or after unplug of the device from the USB, the following view is displayed.



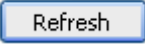
The Device Configuration view has four main areas:

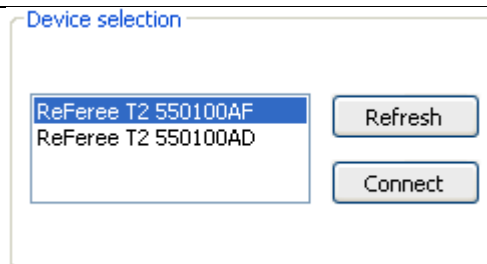
- **Device selection:** allows listing, selecting and connecting to a specific device. Only the supported devices will be listed in the device list.
- **Device Information:** gives information about the connected device.
- **Device Plugins:** gives information about the plugins available on the device and their status (enabled/disabled).
- **Input Configuration:** allows selecting and configuring the inputs of device that will be used for analysis.

5.10.2 Connect a device

To connect to a device, follow the procedure describe below.

Connect the device to a USB port of the computer

Click the  button of the Device Selection area. This will update the Device Selection area with the list of supported devices¹. Devices are identified by their part number and serial number.



Select the device to connect to and click connect. It will update the Device information and Input Configuration areas.



To select another device while already connected, select the new device and click connect.

If a device is already connected to the DiviSuite, the connection is automatically done as described in §4.1.

¹ It may be needed to click again the "Refresh" button until the operating systems detects and configures the USB device.

Once connected, the following view is displayed (Input Configuration content depends on the connected device).

Device selection

ReFeree T2 550110BD

Refresh

Connect

Device information


P/N: ReFeree T2
S/N: 550110BD
MicroCode: 4.0
FPGA: 11.3
Calibration: 2012/03/28

Device Plugins

RF Scope ☒
TS Analyzer ☒
T2MI Analyzer ☒

Input Configuration

RF
ASI
IP
File

Channel name	Frequency (M...	Bandwidth	Standard	Comments
Channel1	666.000	8 MHz	DVB-T2	MAX A
Channel 2	474.000	8 MHz	DVB-T2	MUX B

+ - ↺ ↻ ↕ ↴ ↵




5.10.3 Select device mode

For devices supporting player and analyzer mode, the following view is displayed. The "Analyzer Mode" and "Player Mode" buttons allow selecting between analyzer and player mode.

Device selection

DiviDual LVDS 545100AB

Refresh

Connect

Device information


P/N: DiviDual LVDS
S/N: 545100AB
MicroCode: 4.0
FPGA: 2.3

Device Plugins

RF Scope ☐
TS Analyzer ☒
T2MI Analyzer ☒


Analyzer Mode


Player Mode

Input Configuration

ASI
SPI
IP
File

SPI input is self configured

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5.10.4 Device Information

Device Information area allows identifying the device and its software revision as to be provided to ENENSYS TESTSYSTEMS support.

The **"Calibration"** information provides the date of the calibration file registered for the connected device. It only applies to ReFeree T2 and ReFeree II devices.

Important Note: *If the calibration information for ReFeree T2 or ReFeree II is set to "None", no calibration file is registered and RF measurements will not be valid. Please refer to §3.3 for calibration file registration.*

5.10.5 Device Plugins

Device Plugins area gives information on the registered plugins for the connected device.

Important Note: *If a plugin is not registered, the features belonging to this plugin will not be activated. Please refer to §3.2 for plugin registration.*

5.10.6 *Input Selection and Configuration*

5.10.6.1 Input selection and configuration with analysis stopped

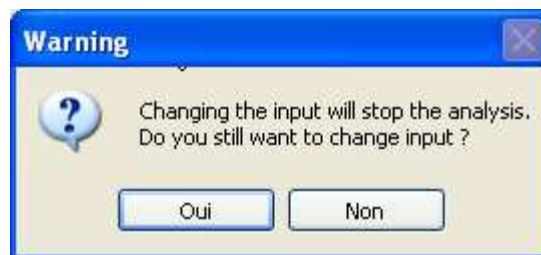
Input Configuration view allows selecting and configuring the input that will be used for the analysis and its parameters. Most of the inputs manage a list of configuration: RF channels, ASI input, IP streams or TS file streams. Configuration for such inputs shares a same framework allowing adding, removing and modifying channel. This is described in the following chapters.

Once an input has been selected and configured, analysis can be started for this input (refer to §5.5.2 for information on starting an analysis).

5.10.6.2 Input selection and configuration with analysis started

While an analysis is started, configuration of the input is disabled. Analysis must be stopped by the user to enable modification.

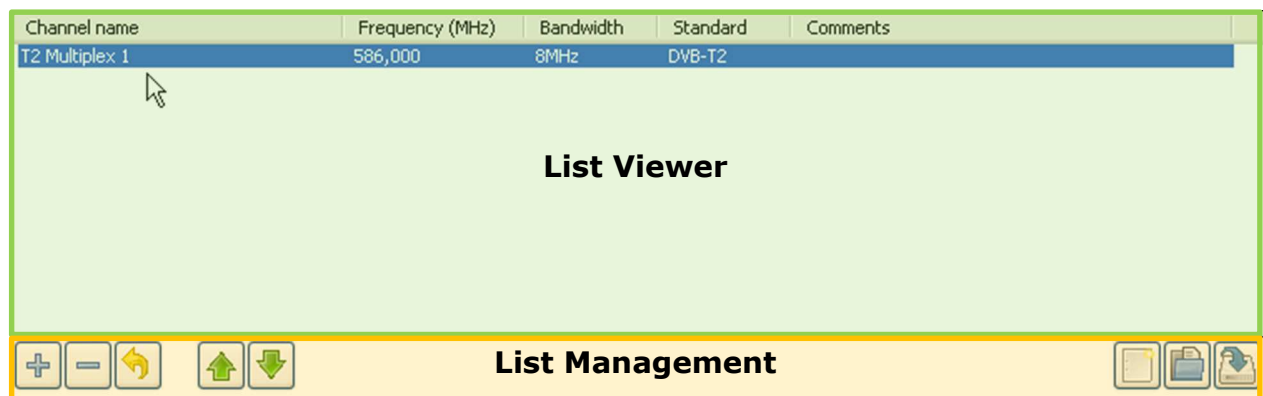
While an analysis is started, selecting another input will stop the analysis. The following confirmation message is displayed to prevent from stopping the analysis.



If the user chooses to stop the analysis, he will need to restart it manually as described in §5.5.2.

5.10.6.3 List configuration

Input configuration includes a list management mechanism. This chapter describes the common management of such list.



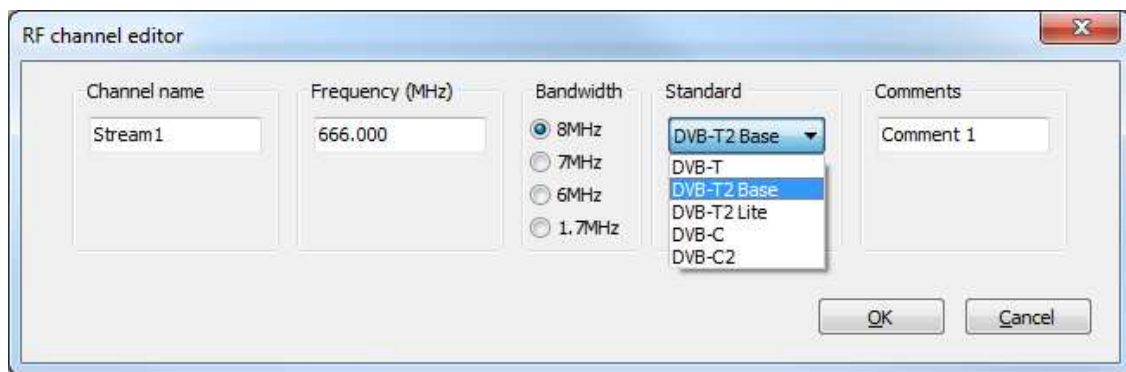
List Viewer area depends on the input. It shows each element of the list for the selected input (the example above shows list viewer of RF Input). Elements of the list can be selected by clicking on it. It then appears highlighted, as in the example above.

List Management area contains the buttons for managing the list. Their usage is described below.

	Add an element to the list. It opens a window for selecting the parameters of the element. This window depends on the input and will be described in the next chapters.
	Remove the selected element from the list
	Modify the selected element of the list. It opens the same window as for the add element with fields already configured.
	Move the selected element up in the list
	Move the selected element down in the list
	Create a new list. Current list will be deleted. A confirmation message is displayed before deleting the list
	Open a list. It loads a list from a file (this deletes the current one). An open file window is opened for file selection
	Save current list. It saves the current list to a file. A save file window is opened for file selection.

5.10.6.4 RF Input configuration – ReFeree T2, ReFeree II

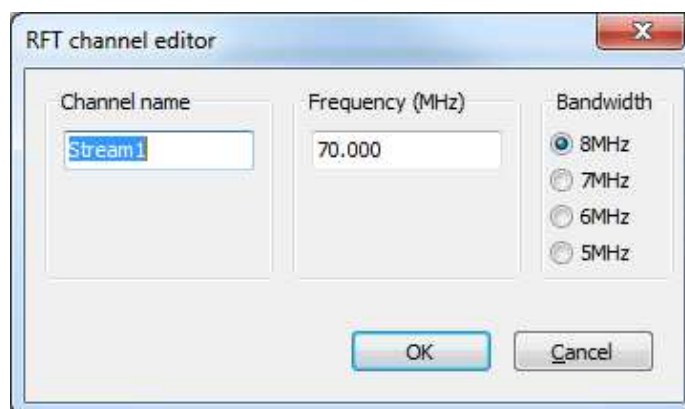
Select the "RF" tab of the "Input Configuration". Then add channels to the channel list by clicking the "+" button. This will open the channel editor window.



- **Channel Name** and **Comments**: user defined text.
- **Frequency**: frequency of the channel to tune to in MHz.
- **Bandwidth**: bandwidth of the selected channel.
- **Standard**: select DVB-T, DVB-T2, DVB-T2 Lite, DVB-C or DVB-C2 to choose which standard is to be used for channel decoding.

5.10.6.5 RF Input configuration – DiviCatch RF-T

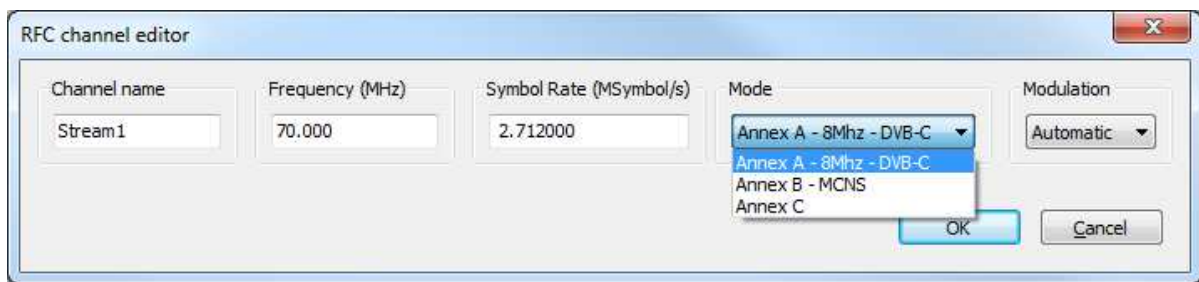
Select the "RF" tab of the "Input Configuration". Then add channels to the channel list by clicking the "+" button. This will open the channel editor window.



- **Channel Name**: user defined text.
- **Frequency**: frequency of the channel to tune to in MHz.
- **Bandwidth**: bandwidth of the selected channel.

5.10.6.6 RF Input configuration – DiviCatch RF-C

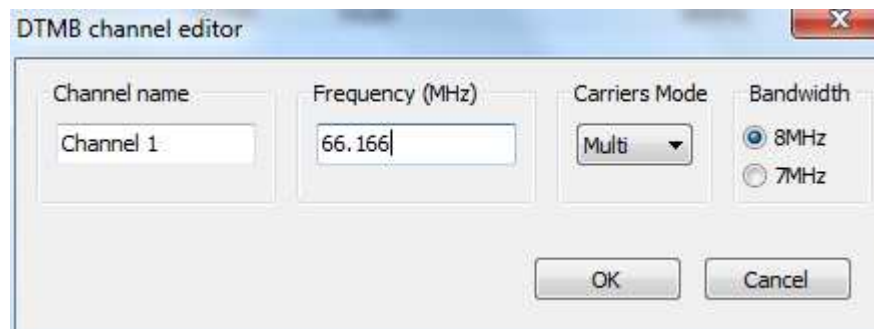
Select the "RF" tab of the "Input Configuration". Then add channels to the channel list by clicking the "+" button. This will open the channel editor window.



- **Channel Name:** user defined text.
- **Frequency:** frequency of the channel to tune to in MHz.
- **Symbol Rate:** Symbol rate of the selected channel in MSymbol/s.
- **Mode:** DVB-C Mode of the channel.
- **Modulation:** select automatic for automatic configuration of the modulation or force a specific modulation.

5.10.6.7 RF Input configuration – DiviCatch RF-DTMB

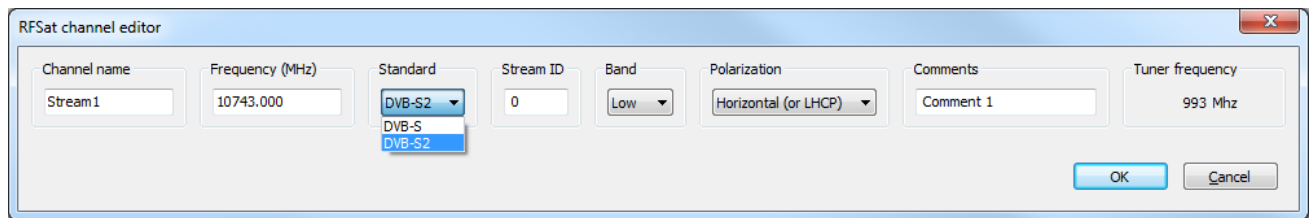
Select the "RF" tab of the "Input Configuration". Then add channels to the channel list by clicking the "+" button. This will open the channel editor window.



- **Channel Name:** user defined text.
- **Frequency:** frequency of the channel to tune to in MHz.
- **Carrier Mode:** multi or single carrier mode selection.
- **Bandwidth:** Bandwidth of the channel.

5.10.6.8 RF Input configuration – DiviCatch RF-S/S2

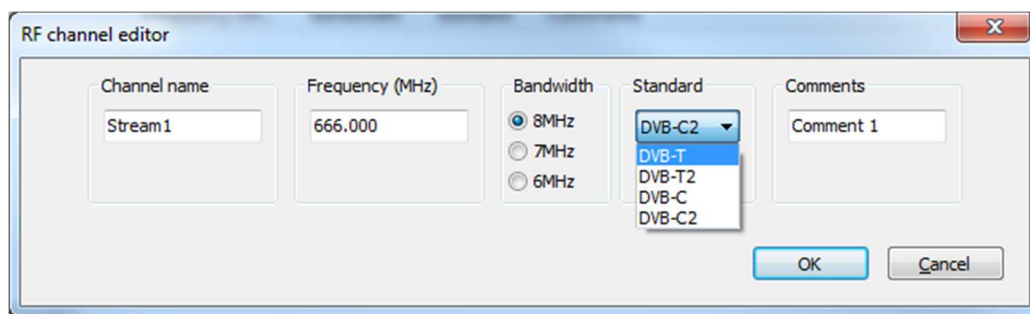
Select the "RF" tab of the "Input Configuration". Then add channels to the channel list by clicking the "+" button. This will open the channel editor window.



- **Channel Name:** user defined text.
- **Frequency:** frequency of the channel to tune to in MHz.
- **Standard:** select DVB-S or DVB-S2 to choose which standard is to be used for channel decoding.
- **Band:** select Low or High.
- **Polarization:** select Horizontal or Vertical.

5.10.6.9 RF Input configuration – DiviCatch RF-T/C T2/C2

Select the "RF" tab of the "Input Configuration". Then add channels to the channel list by clicking the "+" button. This will open the channel editor window.



- **Channel Name:** user defined text.
- **Frequency:** frequency of the channel to tune to in MHz.
- **Bandwidth:** bandwidth of the selected channel.
- **Standard:** select DVB-T, DVB-T2, DVB-C or DVB-C2 to choose which standard is to be used for channel decoding.

5.10.6.10 Configure ASI input

Select the "ASI" tab of the "Input Configuration". No specific configuration is needed on ASI input (auto detection mode is active).

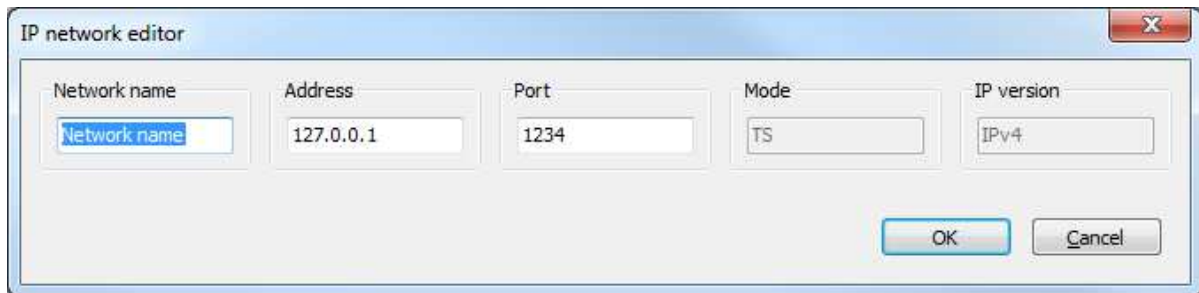
5.10.6.11 Configure SPI input

Select the "SPI" tab of the "Input Configuration". No specific configuration is needed on SPI input (auto detection mode is active).

5.10.6.12 Configure IP Input

Select the "IP" tab of the "Input Configuration". Then add IP streams to the IP stream

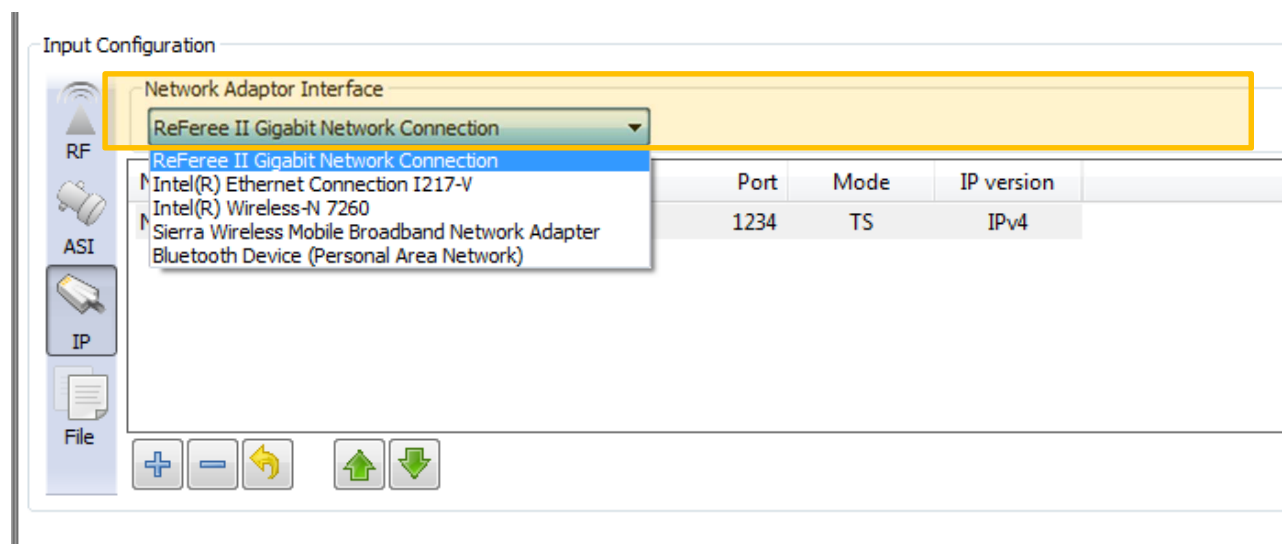
list by clicking the "+" button. This will open the IP streams editor.



5.10.6.12.1 Ethernet Controller selection

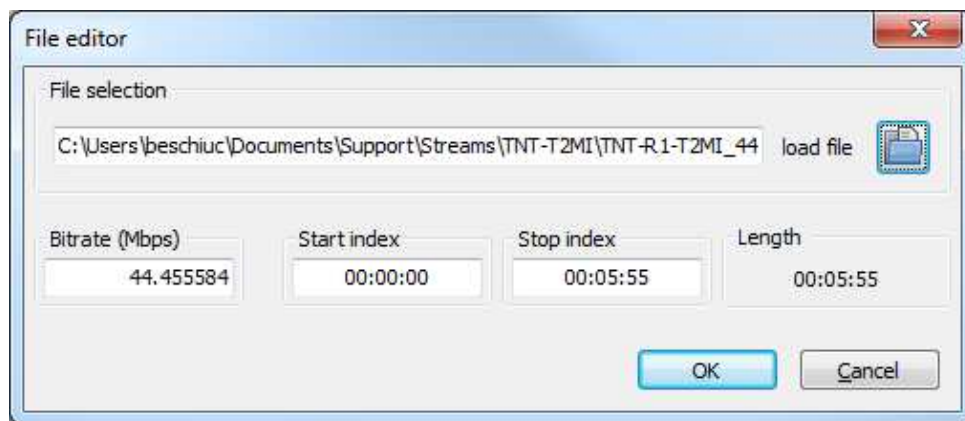
As an IP input, one of the Ethernet controllers of the computer can be used. For ReFeree T2 and ReFeree II devices, the Ethernet Data controller can be also used.

The Network Adaptor Interface lists all detected controllers. Use this field to select which controller should be used for IP reception.

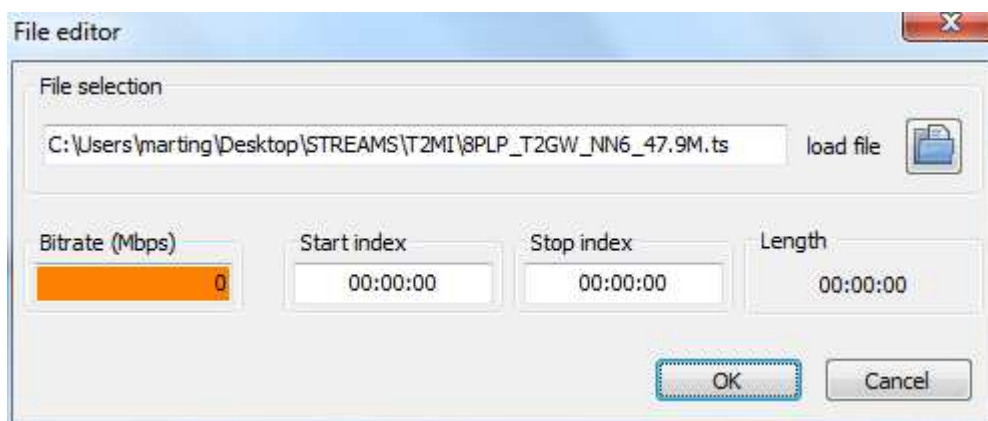


5.10.6.13 Configure File Input

Select the "File" tab of the "Input Configuration". Then add files to the File list by clicking the "+" button. This will open the File editor.

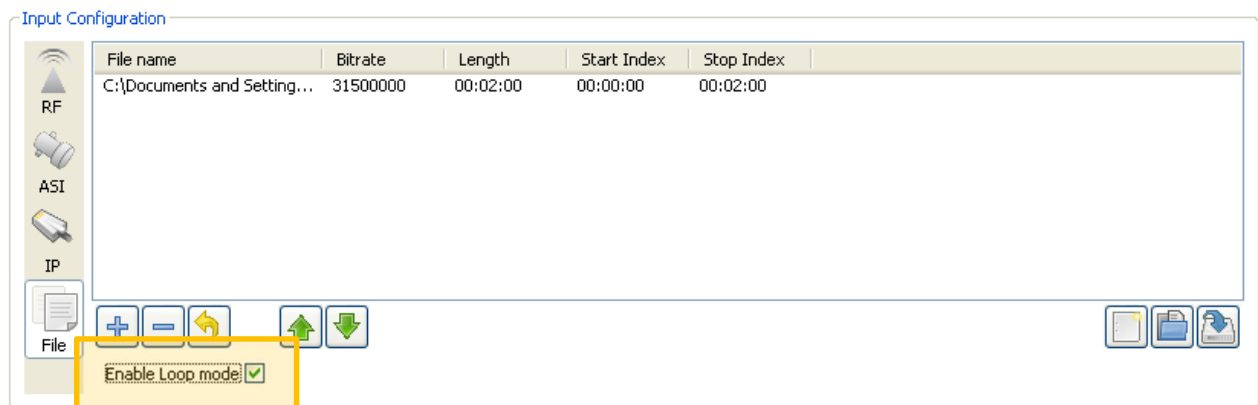


The DiviSuite supports MPEG-2 TS files and T2-MI files. For MPEG-2 TS files which contain PCR information, bitrate is automatically computed and filled. For T2-MI files or MPEG-2 TS files that do not contain PCR information, it is requested to give the bitrate of the stream. Mandatory fields with invalid value appear with an orange background.



5.10.6.13.1 Loop mode activation

DiviSuite allows playing in loop mode the list of files of the File input. To enable or disable the loop mode, check or uncheck the "Enable Loop mode" field.



5.10.7 Output Selection and Configuration

Output Configuration view allows selecting and configuring the output that will be used for the playback and its parameters. **This only applies to Player Mode.** Refer to §5.10.3 for selecting the Player Mode.

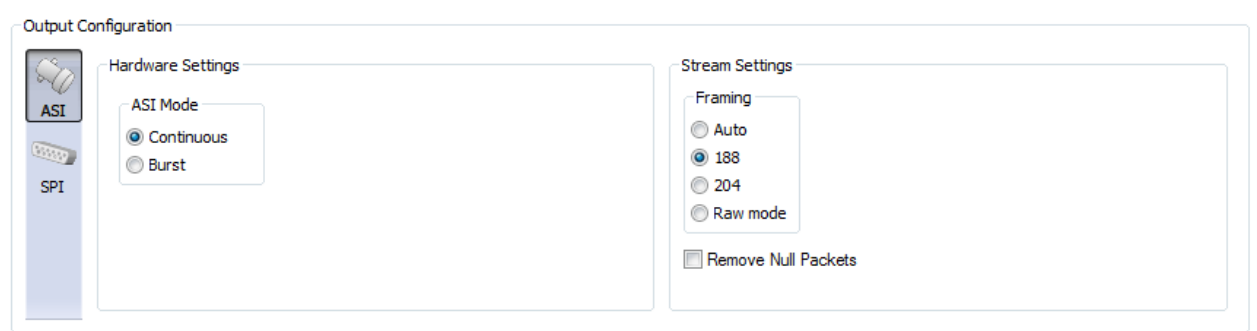
In Player Mode, the device uses a file as stream input. You need to configure the file input before starting the playback. Please, refer to §5.10.6.13 for configuring file input.

Important Note: Output Configuration is available only when no playback is running.

Once an output has been selected and configured, playback can be started (refer to §5.5.2 for information on starting a playback).

5.10.7.1 Configure ASI output

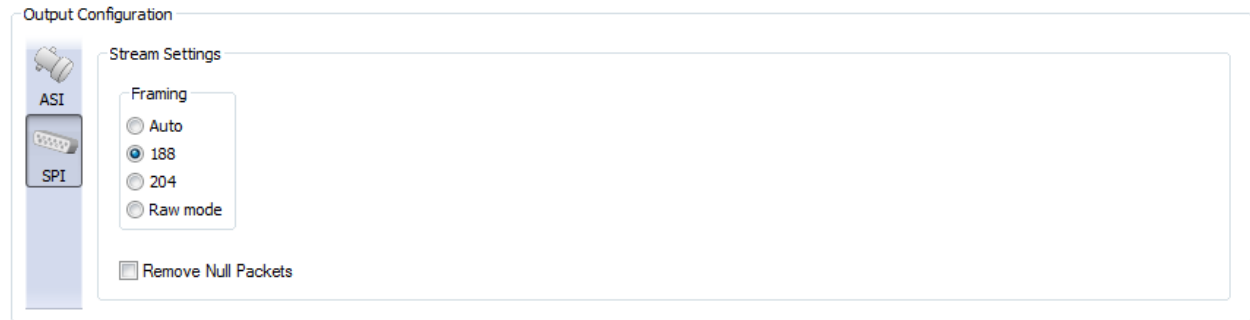
Select the "ASI" tab of the "Output Configuration". Then configure settings for the ASI output.



- **ASI Mode:** select between Continuous or Burst mode.
 - In **Continuous mode**, ASI sync words are added between and inside MPEG-2 TS packets.
 - In **Burst mode**, ASI sync words are only added between MPEG-2 TS packets.
- **Framing:** Select MPEG-2 TS packet size on the ASI output.
 - **Auto:** use the framing used in the input file
 - **188:** force a 188 bytes packet length, whatever the input file framing is. If input file framing is 188 bytes, Reed Solomon bytes are removed from the MPEG-2 TS packets.
 - **204:** force a 204 bytes packet length, whatever the input file framing is. If input file framing is 188 bytes, null Reed Solomon values are added to the MPEG-2 TS packets.
 - **Raw Mode:** In Raw Mode, the device does not take into account the synchronization byte of the MPEG-2 TS packets of the input file. All bytes from the file to the ASI output.
- **Remove Null Packets:** When selected, the device sends the source MPEG-2 TS stream without the MPEG-2 TS null packets (PID 0x1FFF) contained in it. This will result in a variable bitrate transport stream on the ASI output.

5.10.7.2 Configure SPI output

Select the "SPI" tab of the "Output Configuration". Then configure settings for the SPI output.



- **Framing:** Select MPEG-2 TS packet size on the SPI output.
 - o **Auto:** use the framing used in the input file
 - o **188:** force a 188 bytes packet length, whatever the input file framing is. If input file framing is 188 bytes, Reed Solomon bytes are removed from the MPEG-2 TS packets.
 - o **204:** force a 204 bytes packet length, whatever the input file framing is. If input file framing is 188 bytes, null Reed Solomon values are added to the MPEG-2 TS packets.
 - o **Raw Mode:** In Raw Mode, the device does not take into account the synchronization byte of the MPEG-2 TS packets of the input file. All bytes from the file to the SPI output.
- **Remove Null Packets:** When selected, the device sends the source MPEG-2 TS stream without the MPEG-2 TS null packets (PID 0x1FFF) contained in it. This will result in a variable bitrate transport stream on the SPI output.

5.11 Settings view

Settings view allows configuring the analysis of the DiviSuite software.

It has one menu bar per analysis type and a settings area depending on the selected menu bar.

When an analysis is not enabled, fields of the settings are disabled (greyed). If the analysis depends on plugin activation, it is indicated on top of the settings area. The example below does not have RF Scope plugin activated.

Settings comprise various possibilities:

- **Activation or deactivation of an analysis:** deactivating an analysis may be useful if the used computer do not have the required processing power.
- **Activation, configuration and logging of alarm:** alarms can be defined for some parameters analysis. In the Settings view, an alarm can be enabled or disabled per analyzed parameter. For each alarm, it is also possible to enable or disable logging of an alarm. Last, each alarm has configurable threshold.

The following chapters describe the settings for **DiviSuite Basic** software: bitrate and log. Description for plugin specific settings will be given in the plugin dedicated chapters.

RF Tables Bitrate ETR T2-MI GPS Log Report Satel... DiviS...

File File

Alarm settings

Name	On	Log	Mode	Min	Max	Unit
Front End Status	☒	☐	Continuous			
Signal level	☒	☐	Continuous	0	0	dBm
SNR	☒	☐	Continuous	0	0	dB
MER (DVB-T/T2/C2)	☒	☐	Continuous	0	0	dB
LDPC iteration number (DVB-T2/C2)	☒	☐	Continuous	0	0	
Pre LDPC BER (DVB-T2/C2)	☒	☐	Continuous	0	0	
Post LDPC BER (DVB-T2/C2)	☒	☐	Continuous	0	0	
Post BCH FER (DVB-T2/C2)	☒	☐	Continuous	0	0	
Pre Viterbi BER (DVB-T)	☒	☐	Continuous	0	0	
Post Viterbi BER (DVB-T/C)	☒	☐	Continuous	0	0	

5.11.1 Validation of a setting

In all settings panel, when changing a value, a confirmation is needed. In this case, the   icons are displayed. A click on  icon validates the modification while a click on  discards the modification.

These icons allows validation or discards of all settings displayed in the current view.

5.11.2 Activation and log of an alarm

To enable an alarm, check the "On" parameter on the line of the alarm and validate the modification.

To enable logging an alarm, check the "Log" parameter on the line of the alarm and validate the modification.

Two modes are available for alarm firing:

- **Continuous mode:** once the alarm is fired, the alarm's counter is incremented every second and the alarm trigger is logged every second until the alarm conditions are no longer fulfilled.
- **Transition mode:** the alarm is toggled: the counter is incremented once on alarm trigger and the alarm is logged once when the alarm conditions change from valid to invalid and vice versa.

Alarms

Name	On	Log	Mode	Min	Max	Unit	
Overall bitrate	☒	☒	Continuous	3,712	3,756	Mbps	 
Net bitrate	☐	☐	Continuous	3,102	3,500	Mbps	

In order to enable or disable quickly all settings, some panels have a global selection check box.

Alarms

ETR 290 Priority level 1

Name	On	Log	Value (ms)	Min (ms)	Max (ms)	Nominal (ms)
(set/unset all)	☒	☒				
1.1 TS_sync_loss	☒	☒				
1.2 Sync_byte_error	☒	☒				

5.11.3 Bitrate setting

Bitrate settings allow defining minimum and maximum threshold which fire an alarm. A threshold can be defined for:

- The overall bitrate of the MPEG-2 TS stream
- The Net bitrate of the MPEG-2 TS stream
- The bitrate of a specific PID

To add bitrate monitoring for a specific PID, enter the value in the text field of the “**PID bitrate alarms**” group box and click on “+” button. To remove it, enter the value in the text field and click on “-”.

When an analysis is running, it is also possible to select between the PID of the stream. Click on the  button to refresh the PID list of the drop down list then select the PID in the list.

5.11.4 Log setting

Log setting allows configuring the log file management of the DiviSuite. It allows defining the log file that will be used by DiviSuite.

A stop condition on the log file needs to be defined. This allows recording logs only during specific analysis duration or preventing from a huge file size of the log file. This is configurable through the Size or Duration fields while the Measurement field limits the number of lines in the log file.

RF Tables Bitrate ETR 290 T2-MI GPS Log File Report Satel... DiviS...

☒ Enable Log File

File Segment Configuration

Basename

Size Control

☒ Size (in MB)

☐ Duration : :

☐ Measurements

☒ ☐

5.11.5 DiviSuite setting

This setting allows configuring the behavior of the application at startup. DiviSuite can automatically start an analysis on the same device, same input and same channel of the analysis running when application was last quit.

To do so, check the "Restart analysis at application start-up".

RF Tables Bitrate ETR 290 T2-MI Log File Report File DiviSuite

Configuration

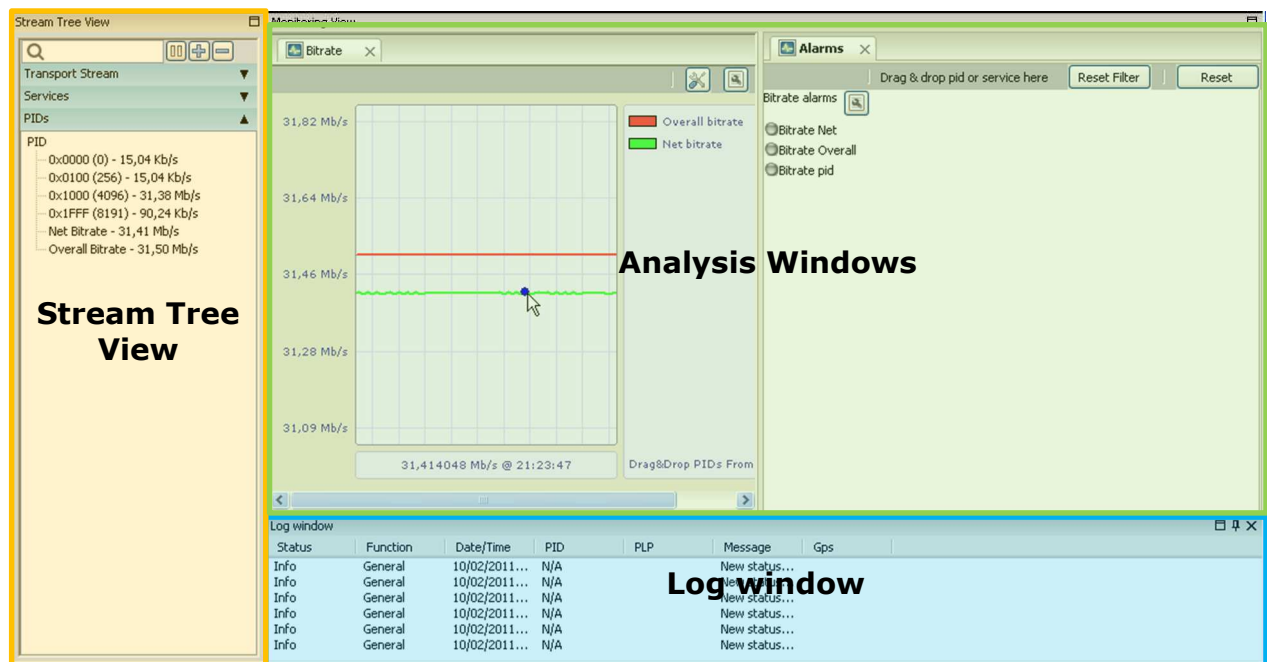
☐ Restart analysis at application start-up

5.12 Monitoring View

5.12.1 Overview

The Monitoring View is a configurable area which receives monitoring windows for each analysis. Three main areas are available:

- Stream Tree View
- Analysis Windows
- Log Windows



5.12.2 Stream Tree View in DVB-T2

The Stream Tree View displays three kinds of information:

- o A search tool
- o Available PLPs if the incoming is DVB-T2 (RF or baseband)
- o Transport Stream content parsing:

The search tool allows searching for a specific label in the complete Transport Stream tree. This allows to quick find a specific label (field name, value...) in Transport Stream, Services or PIDs tree.

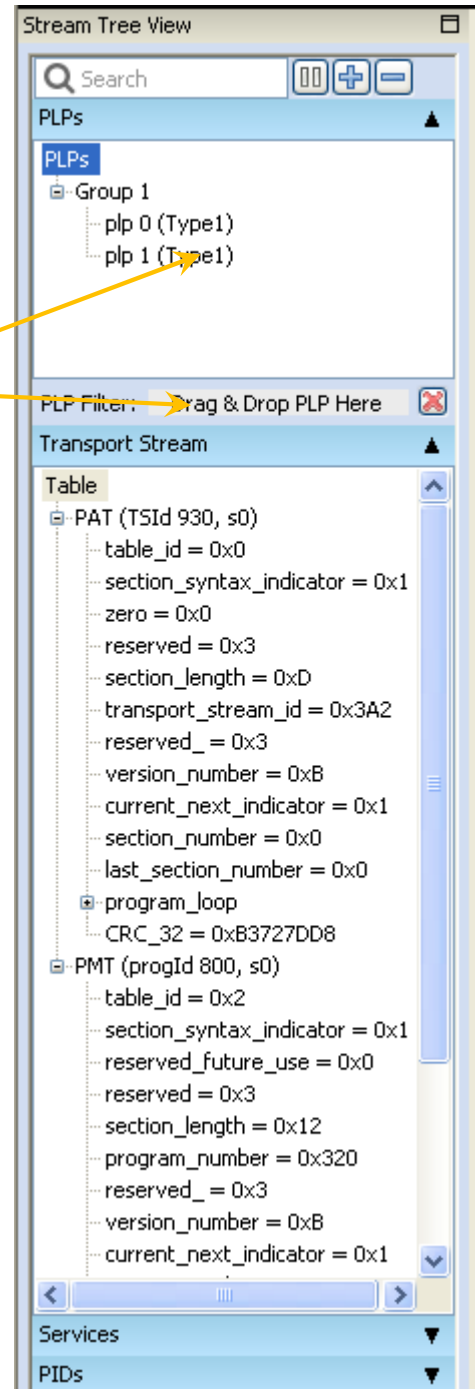
The "PLPs" tab displays the list of Physical Layer Pipes if the incoming stream is a DVB-T2 one (RF or baseband). It allows selecting which PLP will be used for the analysis:

- With the mouse, select a PLP in the "PLPs" list
- Drag and drop to "PLP Filter"

The Transport Stream tab displays MPEG-2 TS content of a PLP or of the incoming MPEG-2 TS baseband stream. The content can be browsed by:

- o PID list: list of PIDs detected
 - o This is always available
- o Transport Stream: list the SI tables and their content
 - o Needs TS Analyzer plugin
- o Services: list the Services and the associated program
 - o Needs TS Analyzer plugin

The information are displayed in trees that can be expanded or collapsed by using the + and - icons.



5.12.3 Stream Tree View in DVB-T

The Stream Tree View displays three kinds of information:

- o A search tool
- o Available hierarchical modes if the incoming is DVB-T
- o Transport Stream content parsing:

The search tool allows searching for a specific label in the complete Transport Stream tree. This allows to quick find a specific label (field name, value...) in Transport Stream, Services or PIDs tree.

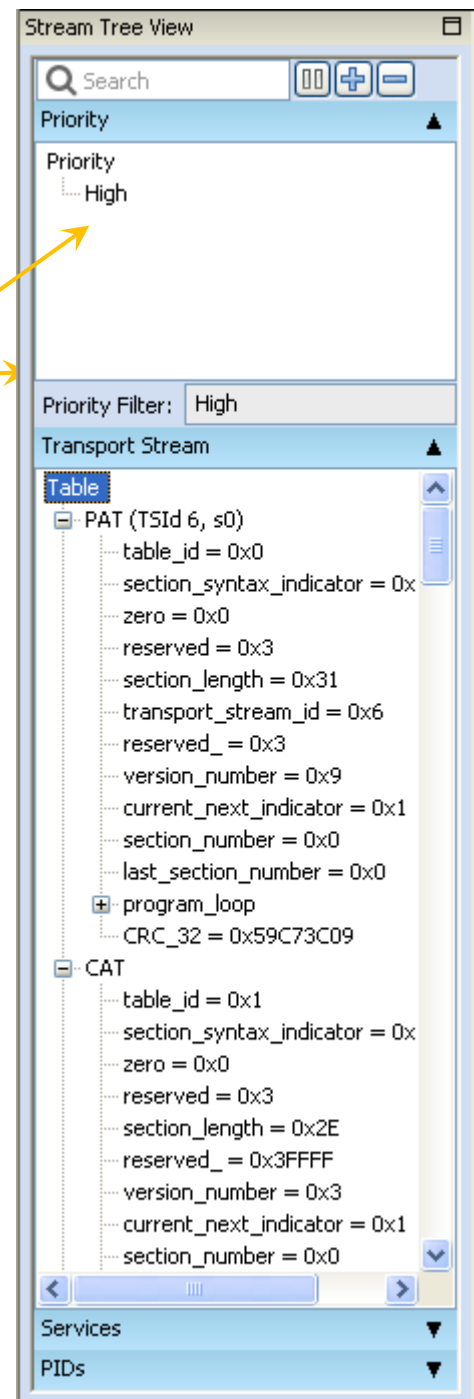
The "Priority" tab displays the list of Hierarchical Mode for a DVB-T incoming stream. It allows selecting which mode will be used for the analysis:

- With the mouse, select a priority in the "Priority" list
- Drag and drop to "Priority Filter"

The Transport Stream tab displays MPEG-2 TS content of a PLP or of the incoming MPEG-2 TS baseband stream. The content can be browsed by:

- o PID list: list of PIDs detected
 - o This is always available
- o Transport Stream: list the SI tables and their content
 - o Needs TS Analyzer plugin
- o Services: list the Services and the associated program
 - o Needs TS Analyzer plugin

The information are displayed in trees that can be expanded or collapsed by using the + and - icons.



5.12.4 *Stream Tree View tools*

5.12.4.1 Search tool

The « Search » field on the top of the Stream Tree View allows to search for a label or a value in all the Stream Tree View. Enter the searched value and hit "Enter" until you find the field of interest.

5.12.4.2 Report tool

Stream Tree View allows Copy/Paste functionality. Select the part of the tree you want to copy by clicking on it (it could be on the root or on a leaf of the tree), type CTRL+C.

The content of the selected field and all associated fields is copied in the clipboard of the Windows operating system and can then be copied in another application.

5.12.5 *Logs View*

This window displays the logs on the fly. The log for specific parameters can be configured and enabled via the "Settings" panel.

5.12.6 *Monitoring Windows*

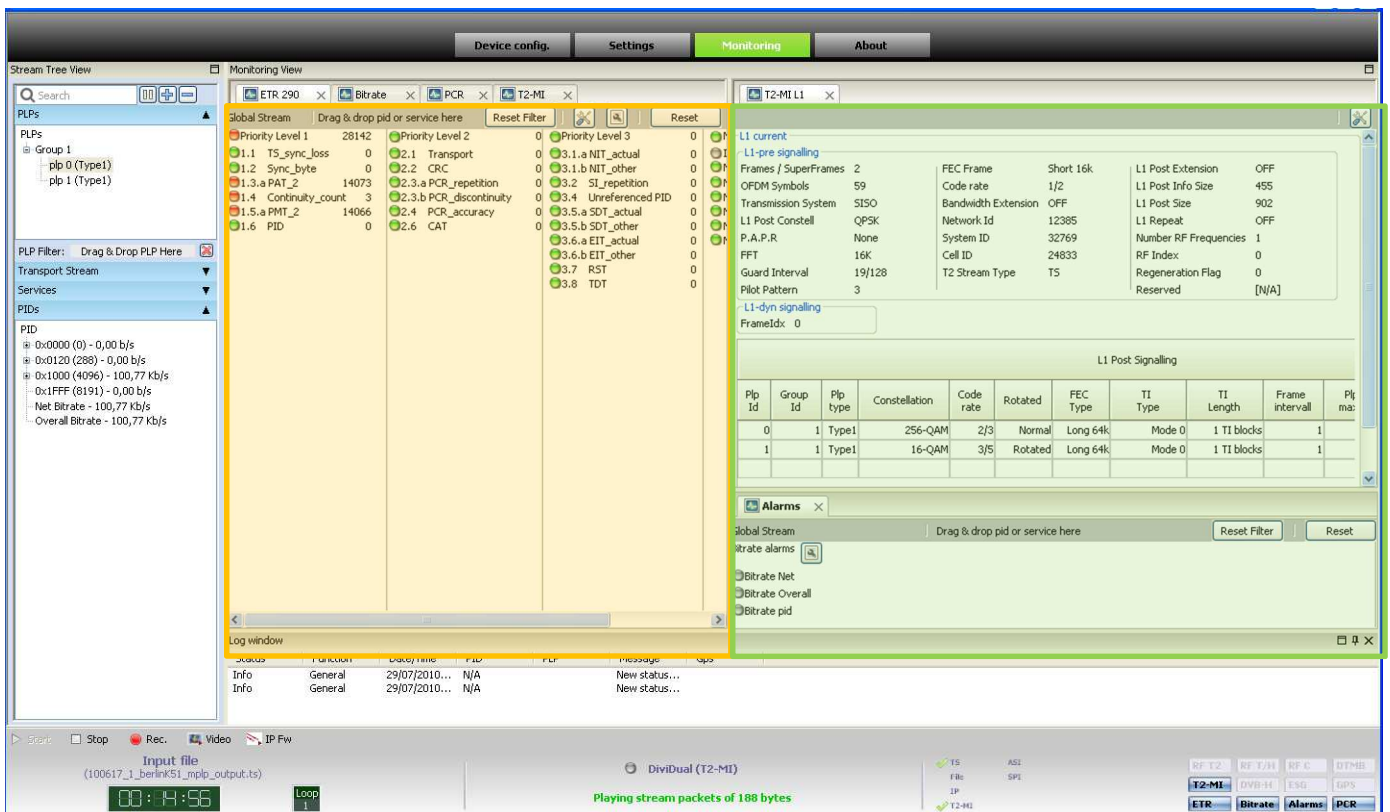
The Monitoring View contains the panels for specific analysis. Those panels can be displayed or hidden by clicking on the button of the Monitoring View Control of the Status Bar Panel as defined in §5.7.



5.12.6.1 Customization of the Monitoring Windows position

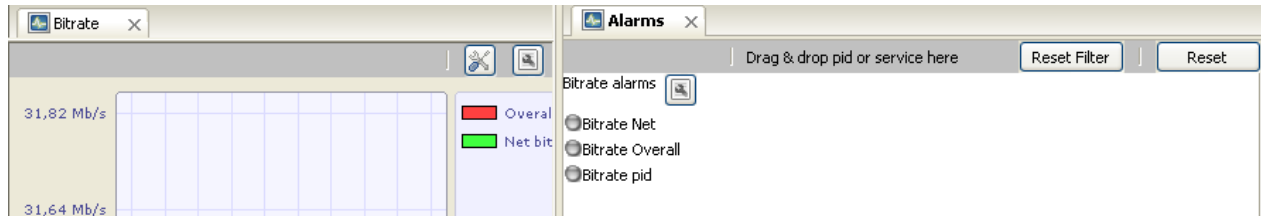
The Monitoring Windows position is configurable. It can be displayed by tabs (orange area below) or tiled (green area below). To configure your global view:

- o Choose a view by selecting its tab
- o Drag inside the monitoring view: Available area for dropping appears in blue.
- o Drop when you find the position you want.



5.12.6.2 Typical control of monitoring windows

Monitoring Windows have some common controls to ease the use of DiviSuite.



The  icon is a shortcut to go to the Device Configuration panel.

The  icon is a shortcut to go to the settings panel of the analysis of the monitoring window.

Some windows also have PID or Services filtering. It allows running the analysis of the windows only on the selected PID or Services.



To run the analysis on a specific PID or Service, select this PID or Service in the Stream Tree View and drop it in the indicated area ("Drag & drop pid or service here").

The "Reset Filter" button removes the filtering analysis of the current PID or Services to apply it to the whole stream.

The "Reset" button reset all values of the analysis windows. It is for example used to reset error counters.

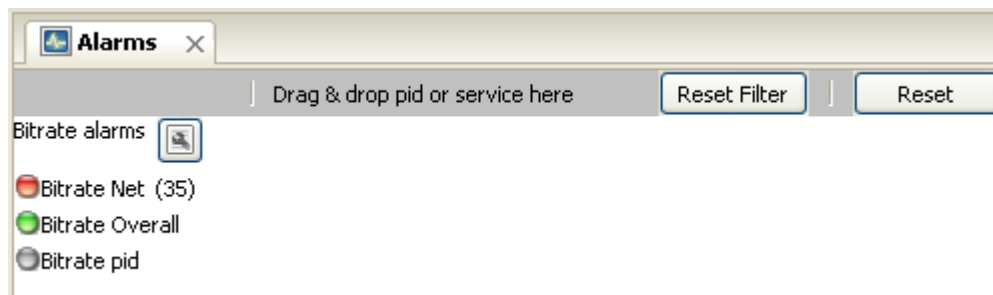
5.12.7 Alarm Monitoring Window

Alarms are fired when a parameter go outside the range defined in the settings panel. Alarm analysis can be done on the whole stream content or specific part by PID or service filtering.

An alarm has three possible states:

- Greyed: the alarm has not been activated in the Settings panel
- Green: alarm is activated and no out of range has been detected on the parameter
- Red: alarm is activated and out of range has been detected on the parameter. A counter is displayed at the right of the alarm indicating how many times it has been fired, according to continuous or transition mode defined in the Settings Panel.

Each analysis has its own alarms defined. All activated alarm will be displayed in this panel.



5.12.8 Log Monitoring Window

The Log monitoring view displays all events of interest of the analysis: analysis start and stop, alarms for which logging has been enabled...

Independently of Log file activation in the Settings Panel, this window is always displayed. It can be docked using the icon in its top right.

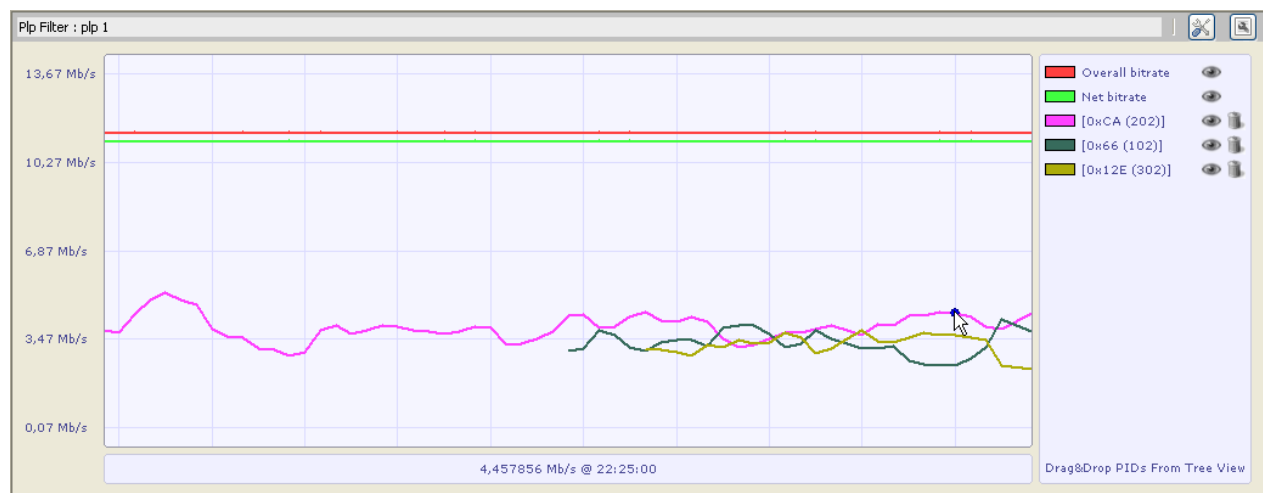
Status	Function	Date/Time	PID	PLP	Message	Gps
Critical	Bitrate	10/02/2011 22:09:00	N/A		Net bitrate (31,4095) went above 10,000	
Critical	Bitrate	10/02/2011 22:08:59	N/A		Net bitrate (31,4140) went above 10,000	
Critical	Bitrate	10/02/2011 22:08:57	N/A		Net bitrate (31,4095) went above 10,000	
Critical	Bitrate	10/02/2011 22:08:57	N/A		Net bitrate (31,4140) went above 10,000	
Critical	Bitrate	10/02/2011 22:08:56	N/A		Net bitrate (31,4095) went above 10,000	
Critical	Bitrate	10/02/2011 22:08:54	N/A		Net bitrate (31,4140) went above 10,000	
Critical	Bitrate	10/02/2011 22:08:54	N/A		Net bitrate (31,4095) went above 10,000	
Critical	Bitrate	10/02/2011 22:08:53	N/A		Net bitrate (31,4171) went above 10,000	
Critical	Bitrate	10/02/2011 22:08:52	N/A		Net bitrate (31,4125) went above 10,000	
Critical	Bitrate	10/02/2011 22:08:51	N/A		Net bitrate (31,4110) went above 10,000	
Critical	Bitrate	10/02/2011 22:08:49	N/A		Net bitrate (31,4125) went above 10,000	
Critical	Bitrate	10/02/2011 22:08:49	N/A		Net bitrate (31,4140) went above 10,000	
Critical	Bitrate	10/02/2011 22:08:48	N/A		Net bitrate (31,4095) went above 10,000	
Critical	Bitrate	10/02/2011 22:08:46	N/A		Net bitrate (31,4140) went above 10,000	
Critical	Bitrate	10/02/2011 22:08:46	N/A		Net bitrate (31,4080) went above 10,000	
Critical	Bitrate	10/02/2011 22:08:45	N/A		Net bitrate (31,4125) went above 10,000	
Critical	Bitrate	10/02/2011 22:08:43	N/A		Net bitrate (31,4110) went above 10,000	
Critical	Bitrate	10/02/2011 22:08:43	N/A		Net bitrate (31,4125) went above 10,000	
Info	General	10/02/2011 21:18:48	N/A		New status : In progress	
Info	General	10/02/2011 21:18:28	N/A		New status : Stopped	
Info	General	10/02/2011 21:18:16	N/A		New status : In progress	
Info	General	10/02/2011 21:17:47	N/A		New status : Stopped	
Info	General	10/02/2011 21:16:54	N/A		New status : In progress	
Info	General	10/02/2011 21:16:48	N/A		New status : Device opened	

5.12.9 Bitrate Monitoring View

The Bitrate monitoring view display bitrate for overall and net bitrate as well as bitrate for specific PIDs. To add a PID to this display, select the PID in the Stream Tree View and drag'n'drop it in this window.

The  icon is used to show () or hide () the graph of a specific bitrate. The  icon allows moving a PID from the monitoring graph.

When moving the mouse pointer on top of graphs, the displayed is freezed and value is displayed in the bottom of the windows with the computer time of the measure.



5.13 Profile management

In order to keep track of configuration, DiviSuite uses profiles to store the settings. A configuration profile is saved for each device that has been connected to the DiviSuite. The configuration profiles are saved on the machine upon DiviSuite close.

6 RF Scope plugin

RF Scope plugin is the RF Signal Quality Monitoring feature of DiviSuite. It allows monitoring, in real-time, the RF parameters of the incoming signal²:

- Demodulation status (front end lock ...)
- Signal Level, SNR (signal to noise ration), MER (Modulation Error Rate)
- Impulse Response (echoes) in DVB-T/T2/C/C2
- Constellation graph in DVB-T/T2/C/C2
- Error rates: LDPC iteration and BCH BER in DVB-T2/C2, Viterbi and RS in DVB-T/C, BER in DVB-S, PER in DVB-S2
- Modulation parameters: L1 signaling in DVB-T2/C2 (PLP modulations parameters, ...), TPS information in DVB-T

DiviSuite Base allows the reception of RF signals even if the RF Scope plugin is not activated. In the absence of the RF Scope plugin, the signal quality measures are not available.



- | | |
|-------------------------|----------------------------|
| ■ Signal Quality | ■ Constellation |
| ■ Graphs, Report Files | ■ Channel Impulse Response |
| ■ Modulation Parameters | ■ SFN Synchronisation |

6.1 Settings Panel

The Settings panel of RF Scope allows setting alarms on RF values as displayed below. Proceed as described in §5.11.1 and §5.11.2 for the configuration.

² Available RF parameters and accuracy of the measurements depend on the RF adapter used, not on the DiviSuite software. Please, refer to your RF adapter datasheet for more information.

RF Tables Bitrate ETR 290 T2-MI Log File Report File DiviSuite

Alarm settings

Name	On	Log	Mode	Min	Max	Unit
Front End Status	☐	☐	Continuous			
Signal level	☐	☐	Continuous	0	0	dBm
SNR	☐	☐	Continuous	0	0	dB
MER	☐	☐	Continuous	0	0	dB
LDPC iteration number (DVB-T2)	☐	☐	Continuous	0	0	
Pre LDPC BER (DVB-T2)	☐	☐	Continuous	0	0	
Post LDPC BER (DVB-T2)	☐	☐	Continuous	0	0	
Post BCH FER (DVB-T2)	☐	☐	Continuous	0	0	
Pre Viterbi BER (DVB-T)	☐	☐	Continuous	0	0	
Post Viterbi BER (DVB-T)	☐	☐	Continuous	0	0	

Note that when analyzing a specific standard, only the alarms belonging to this standard will be checked (LDPC for DVB-T2, Viterbi for DVB-T for example).

For DVB-T SFN monitoring, the MIP alarms can be set in the Settings panel → ETR 290 View → ETR 290 Miscellaneous/SFN synchronization view.

RF Tables Bitrate ETR 290 T2-MI GPS Log File Report File Satel... DiviS...

☒ Enable ETR 290 analysis

Alarms

ETR 290 Miscellaneous/SFN synchronization

Name	On	Log	Value (ms)	Min (ms)	Max (ms)	Nominal (ms)
(set/unset all)	☒	☐				
INT error min rep	☒	☐	25	0	100	25
INT error max			30000	5000	120000	30000
1 MIP_timing_error in ns	☒	☐	100	100	500000	100
2 MIP_structure_error	☒	☐				
3 MIP_presence_error	☒	☐				
4 MIP_pointer_error	☒	☐				
5 MIP_periodicity_error	☒	☐				
6 MIP_ts_rate_error (bit/s)	☒	☐	1000	0	10000000	1000

For DVB-S/S2, the LNB antenna low and high frequency can be configured in the Settings panel → Satellite view.

The screenshot shows the 'Satellite' tab selected in the top menu bar. Below the menu, the 'LNB' section is visible. It contains two input fields: 'LO frequency low (GHz)' with the value '9.75' and 'LO frequency High (GHz)' with the value '10.6'.

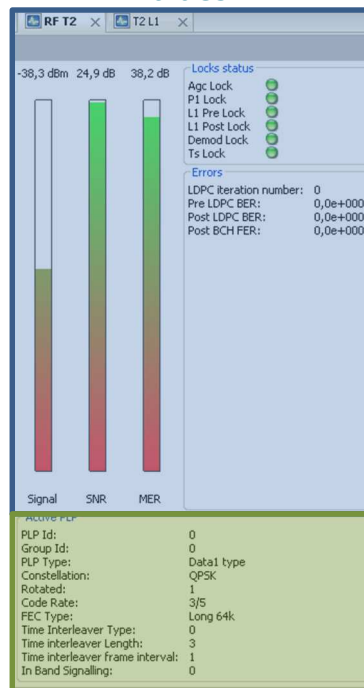
RF	Tables	Bitrate	ETR 290	T2-MI	GPS	Log File	Report File	Satellite	DiviS...
LNB									
		LO frequency low (GHz)		9.75					
		LO frequency High (GHz)		10.6					

6.2 Monitoring views

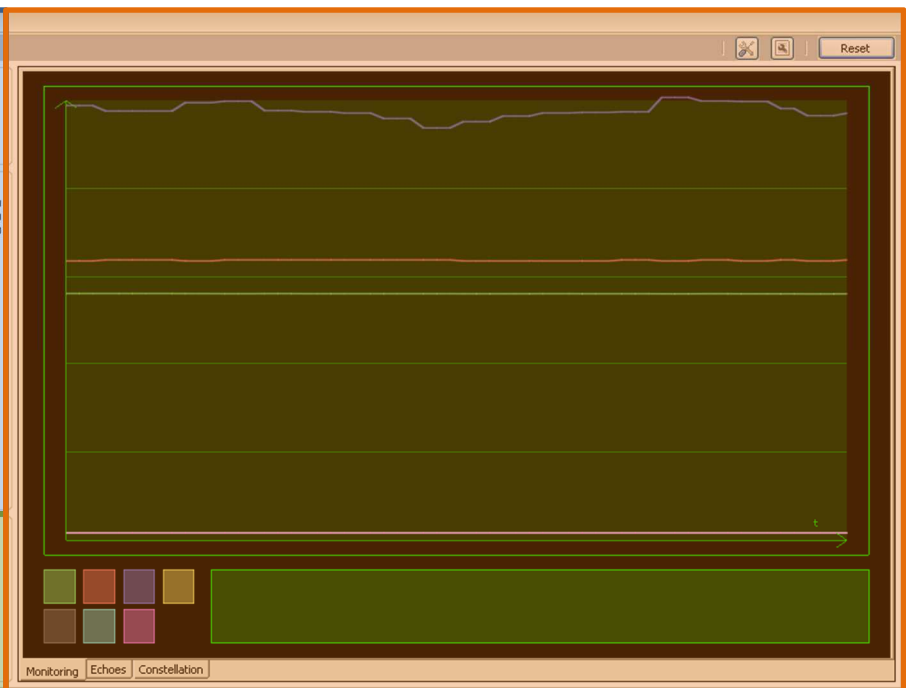
RF Scope Monitoring View includes:

- Instantaneous RF parameters value display using bar graphs,
- Historical value display using graphs,
- Modulation parameters information,
- SFN delay parameters for DVB-T/T2 inputs.

Instantaneous Values



Historical view



DVB-T2 Active PLP Information

Depending on the connected device, the Historical view also includes:

- Echoes (channel impulse response)
- Constellation

On some devices, Constellation display and Transport Stream reception are exclusive. In this case, a "Further RF Measurements" check box is available to select the current mode.

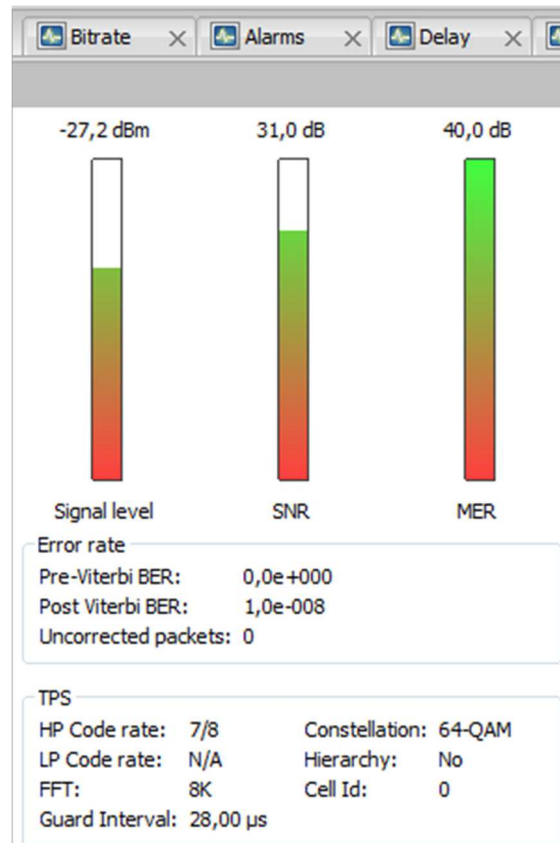
Further RF measurements

☐ Constellation, MER

6.2.1 RF parameters

This view provides a monitoring of instantaneous values over the last 60 seconds:

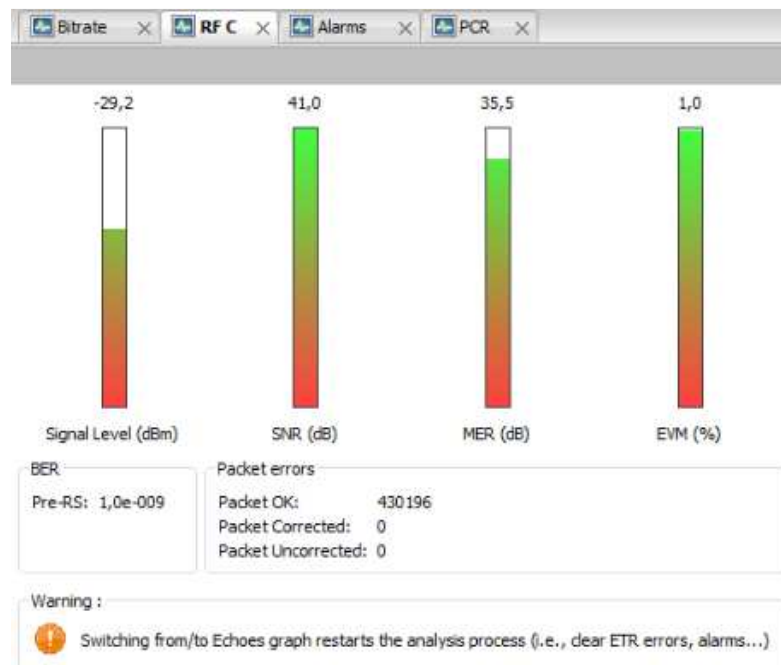
- Signal level
- SNR
- MER
- One or more BER parameters depending on the RF input standard (DVB-T/T2, DVB-C/C2, DVB-S/S2)



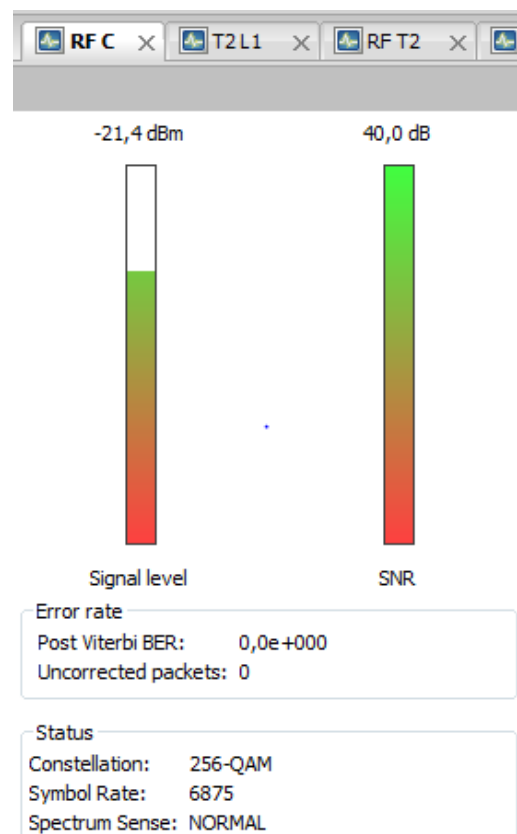
DVB-T RF parameters



DVB-T2 RF parameters



DVB-C RF parameters (DiviCatch RF-C)



DVB-C RF parameters (DiviCatch RF-T/C/T2/C2)

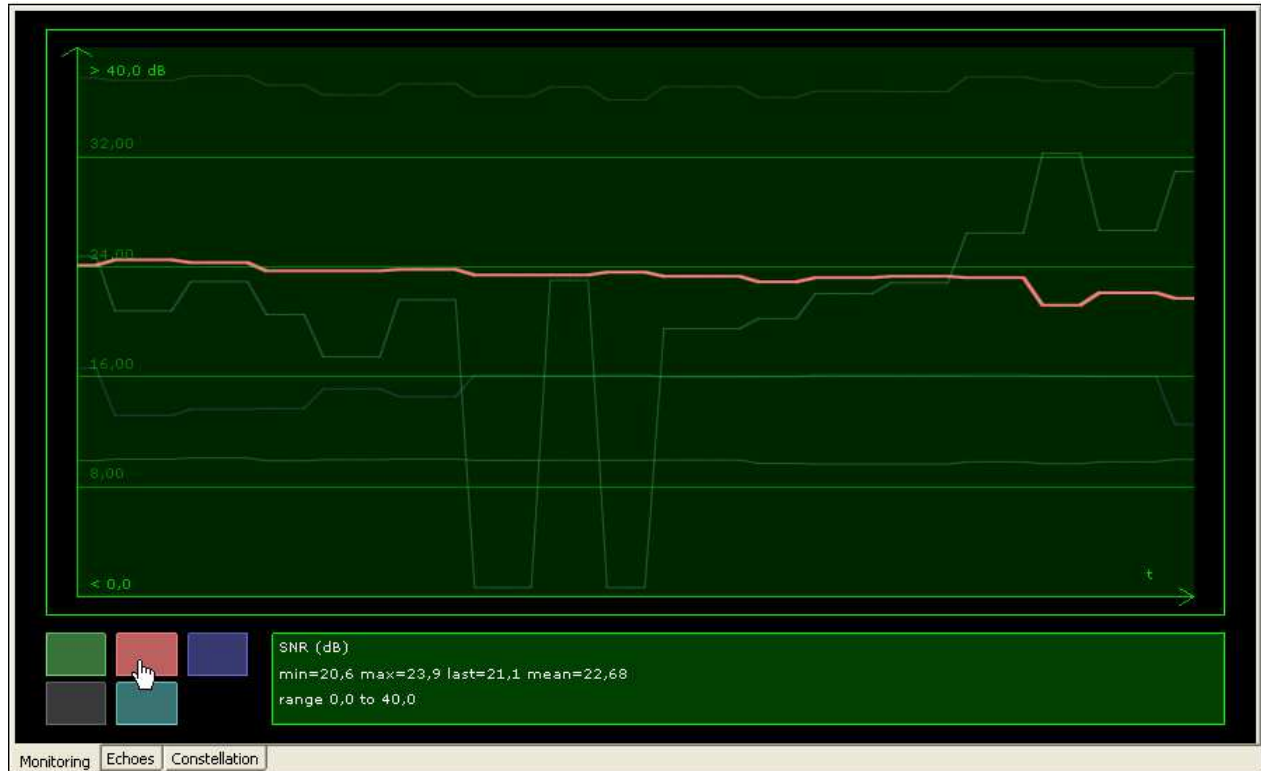


DVB-C2 RF parameters



DVB-S2 RF parameters

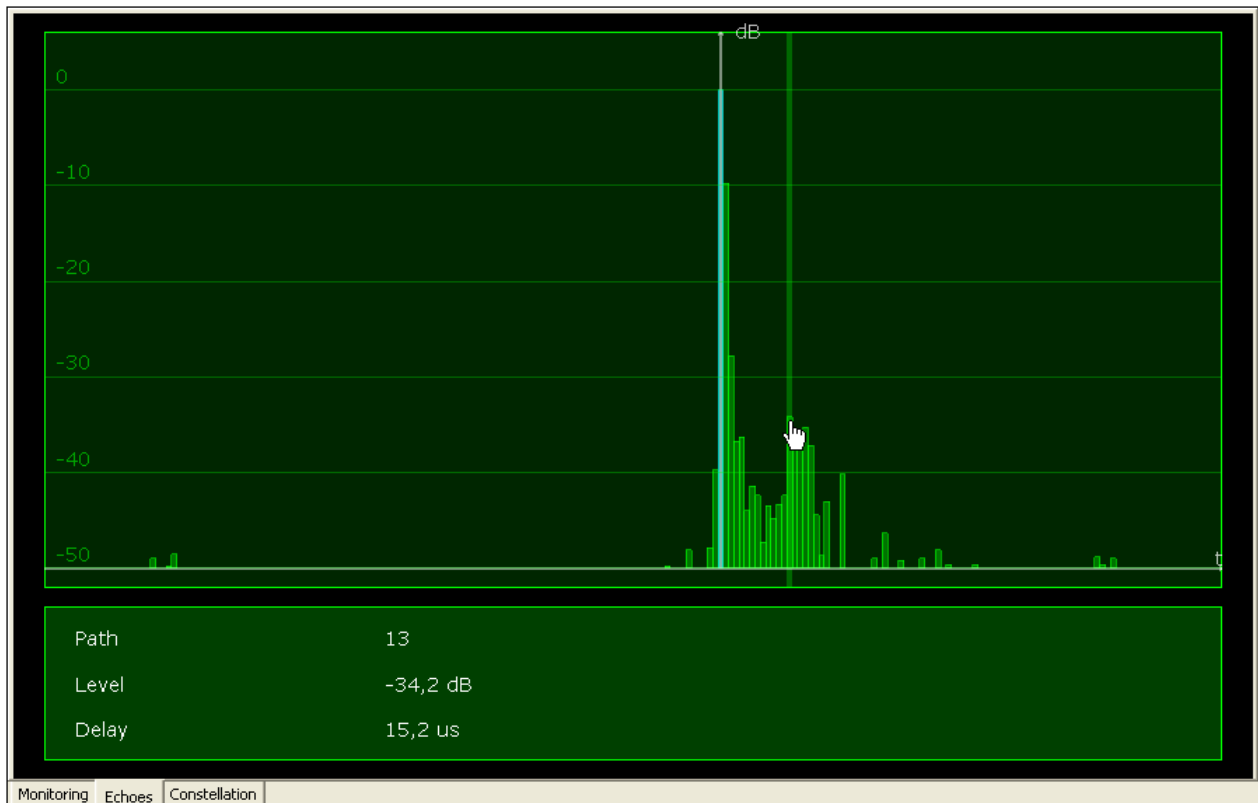
For each measurement, the user can check the minimum value, the maximum value and the average over the last 60 seconds. This can be done by **dragging the mouse pointer over the colored rectangle in the top left of the view.**



6.2.2 Echoes Pattern (Channel Impulse Response)

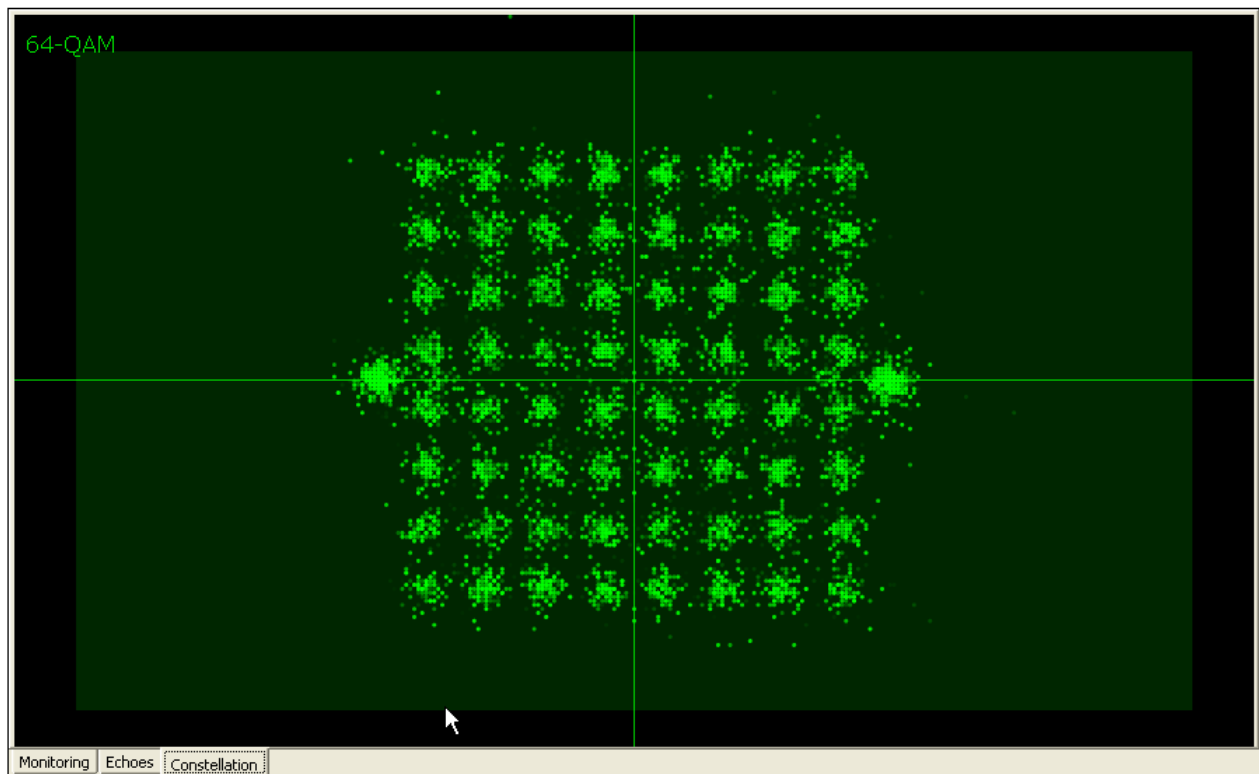
This view displays the instantaneous Channel Impulse Response detected by the receiver.

Main echo appears in blue. **User can check the power level and delay of other echoes from main echo by dragging the mouse pointer over the echo.** Values are displayed in the text area below the graphical view.



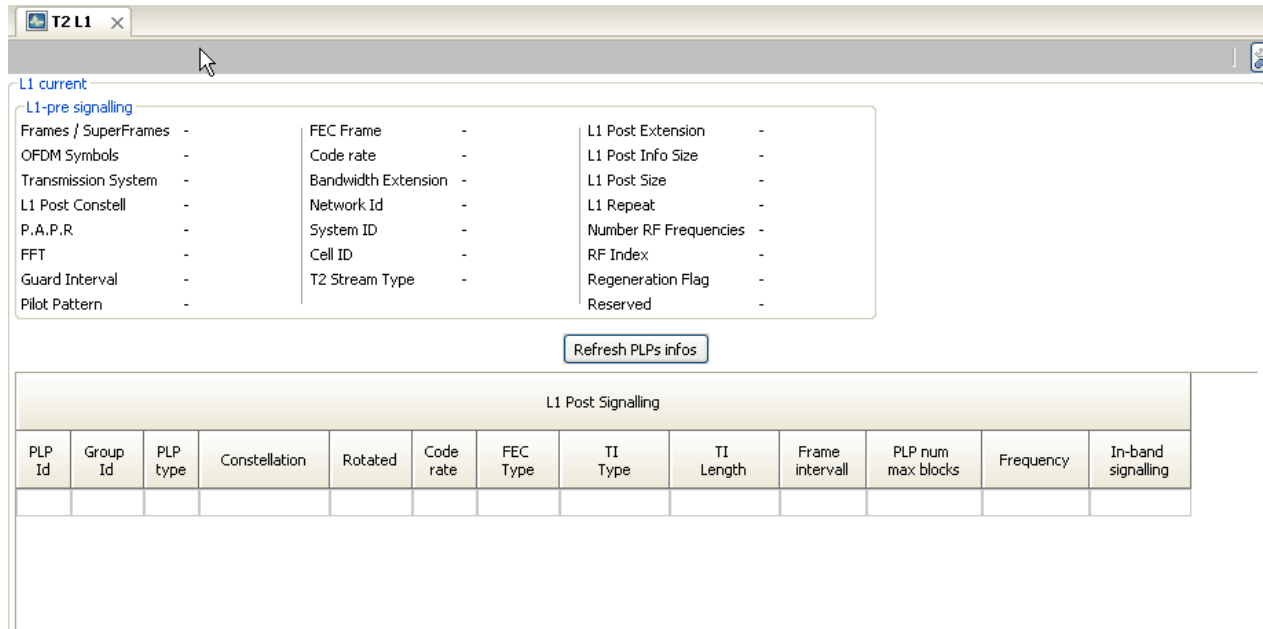
6.2.3 Constellation

This view displays the constellation of the received signal.

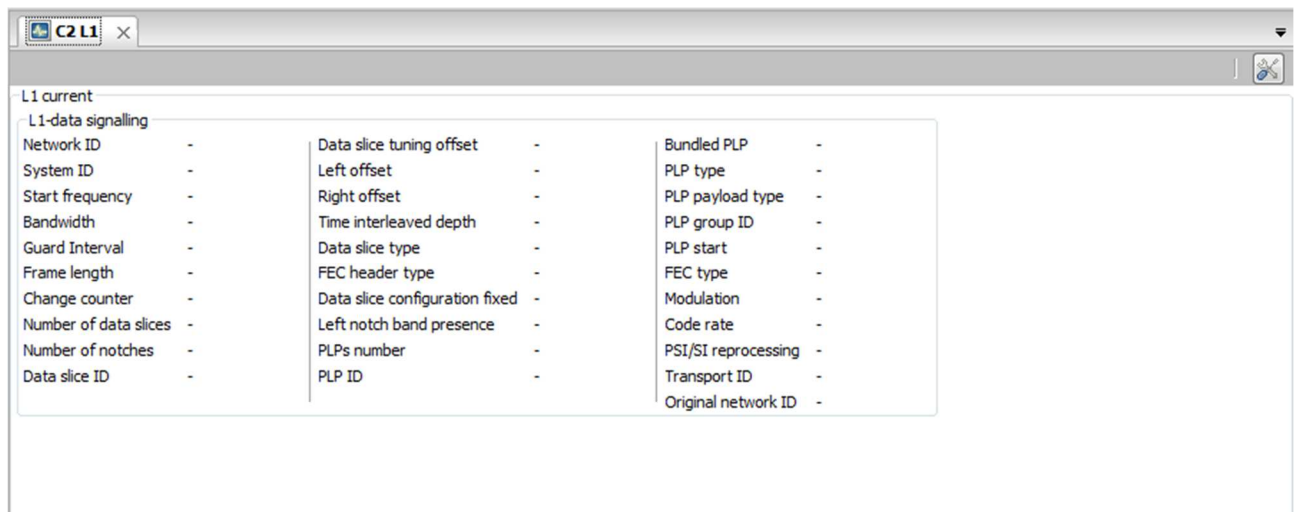


6.2.4 T2 L1, C2 L1

The T2 L1 view displays information conveyed by the L1 signaling. To get L1 post signaling information for all PLPs, click on the “Refresh PLPs infos” to get the values. This stops the current reception of the PLP during the measurement.



The C2 L1 view displays information conveyed by the DVB-C2 L1 signaling.

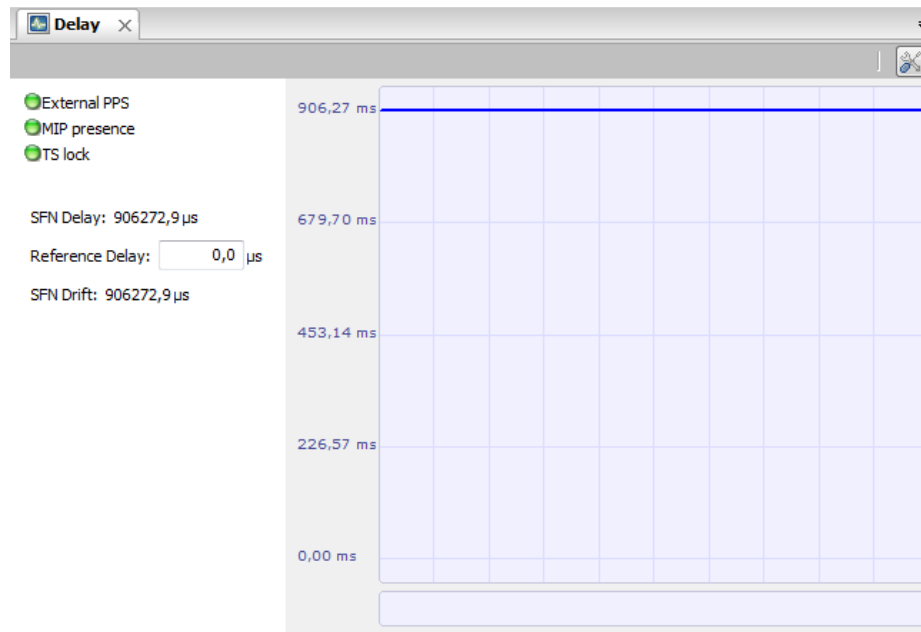


6.2.5 Delay

For the DVB-T analysis, the Delay view displays the following parameters/indicators:

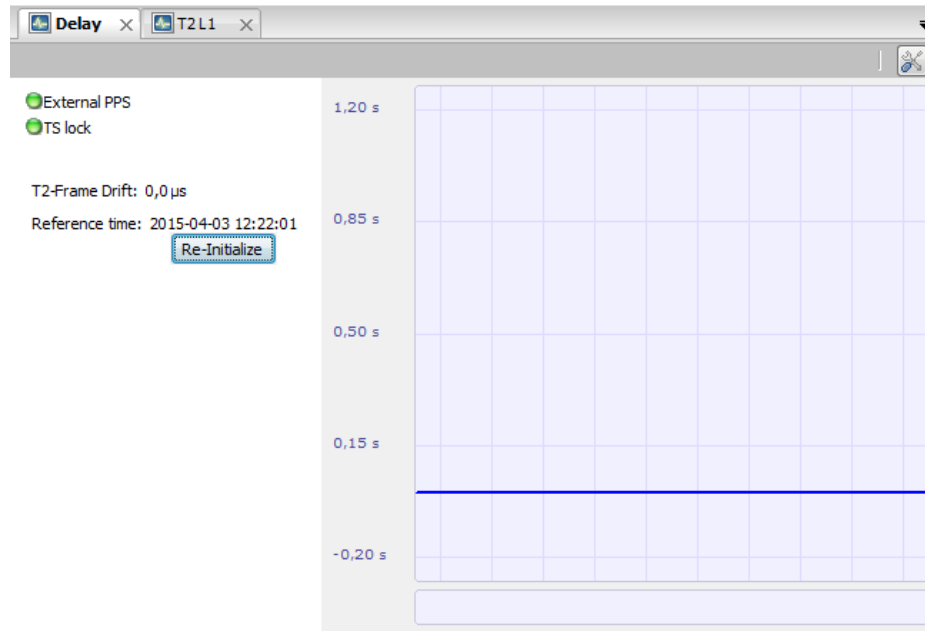
- PPS presence
- MIP presence
- SFN Delay
- SFN Drift

Please refer to appendix §13.1 for information regarding the SFN synchronization mechanism and measurements.



For the DVB-T2 analysis, the Delay view displays the following parameters/indicators:

- PPS presence
- T2-Frame Drift



Please refer to appendix §13.1 for information regarding the SFN synchronization mechanism and measurements.

6.3 Report File

When RF Scope plugin is enabled, the user can access the Report File feature through the Settings panel. It allows creating files with periodic measurement. Report files are CSV files with values separated by a semi colon and field name as the first line.

6.3.1 File Segment

Report File feature allows creating multiple files for the measurement sessions. These files are named segment file. Each segment size can be controlled by the user by setting:

- The maximum segment size in Mega Bytes
- Or the maximum segment time duration
- Or the maximum number of measurements in the segment

Each segment will be named with the following rule:

- Use destination directory of the Basename field
- Use the file basename with `_ {ID}` suffix, where `{ID}` is the segment number
- Use file extension of the Basename

The screenshot below will lead to creating `c:\report-coverage_1.csv`, `c:\report-coverage_2.csv`, ... files with a size of 1MB.

Please note that if segment files already exist with the same rule, they will not be overwritten. Numbering will start at the next available index.

6.3.2 Report

The Record Period field allows setting the periodicity of the measurements, with a minimum of 1 second.

6.3.3 Measurement

The Measurement Records field allows to set the parameters for which the measurements will be recorded.

7 TS Analyzer plugin

The TS Analyzer plugin is the analysis tool for MPEG-2 Transport Stream. TS Analyzer plugin allows parsing the stream content by decoding PSI/SI tables, in addition to the PID parsing feature of the DiviSuite Base IP.

Table parsing supports all standard based on MPEG-2 TS: raw MPEG-2 TS (PAT, PMT), DVB, ATSC and ISDB. It also features private tables and section decoding through configurable scripts.

TS Analyzer plugin also provides ETSI TR 101 290³ priority 1, 2, 3 (ETR290) consistency check of the MPEG-2 TS. It features configurable alarms (parameter alarm activation and threshold) that can be logged. PCR accuracy measurements are also available, providing real-time display of the delay as well as history graph. All ETR290 analysis can be done on specific PID or a service.



- PSI/SI Tables Decoding
- ETSI TR 101 290

- PCR Graphs
- ASI Network Delay

7.1 Settings Panel

Two settings panels are linked to TS Analyzer plugin: Tables and ETR 290.

7.1.1 Tables

The Tables analysis provides the transport stream table decoding (tables, descriptors) according to a specific standard. It can be enabled or disabled in the Setting panel.

Four table decoding standards are already available: MPEG-2 TS, DVB, ATSC or ISDB.

It is also possible to force table decoding on a specific PID. Add and remove PID in the "Specific decoding rules" area.

3

http://www.etsi.org/deliver/etsi_tr/101100_101199/101190/01.03.01_60/tr_101190v010301p.pdf

RF

Tables

Bitrate

ETR 290

T2-MI

DVB-H

ESG

GPS

Log

Report

☒ Enable table parsing

Analysis Settings

Transport stream standard

☐ MPEG Mode

☒ DVB Mode

☐ ATSC Mode

☐ ISDB Mode

Specific decoding rules

PID list to decode(in decimal base)

Add PID

Remove PID

7.1.2 ETR 290

The ETR 290 analysis allows PCR and ETSI TR 101 209 analysis of the stream. It can be enabled or disabled.

ETR 209 Level 1, 2 and 3 are supported. Use the drop down list to view the settings of a specified level. Alarms can be enabled or disabled. For certain alarms, the table repetition rates must be configured (**Value** parameter). The **Min**, **Max**, **Nominal** parameters are not configurable:

- **Min**: the minimum repetition rate that can be measured
- **Max**: the maximum repetition rate that can be measured
- **Nominal**: the maximum repetition rate imposed by the ETSI TR 101 290 standard

RF Tables Bitrate **ETR 290** T2-MI DVB-H ESG GPS Log Report

☒ Enable ETR 290 analysis

Alarms

TR 101 290 Priority level 1

Name	On	Log	Value (ms)	Min (ms)	Max (ms)	Nominal (ms)
1.1 TS_sync_loss	☒	☐				
1.2 Sync_byte_error	☒	☐				
1.3.a PAT_error_2	☒	☐	500	50	5000	500
1.4 Continuity_count_error	☒	☐				
1.5.a PMT_error_2	☒	☐	500	40	25000	500
1.6 PID_error	☒	☐	1000	1000	80000	1000

PCR filter profile

Measurement calibration period: 5s

☐ MGF1 (10mHz)
☐ MGF2 (100mHz)
☒ MGF3 (1Hz)

This profile is provided to give the total coverage of frequency components included in the timing impairments of PCR related measurements. This profile provides the most accurate results in accordance with the limits specified in ISO/IEC 13818-1 [1], clause 2.4.2.1. If jitter or drift rate measurements are found out of specification when using other profiles, it is suggested to use this one for better accuracy.

The PCR analysis is configured using the PCR filter profile as defined by the standard: **MGF1**, **MGF2** and **MGF3** profiles. MGF1 gives the better results in term of accuracy of measurements but needs a lot of time to be valid while MGF3 is fast to provide results but with less accuracy.

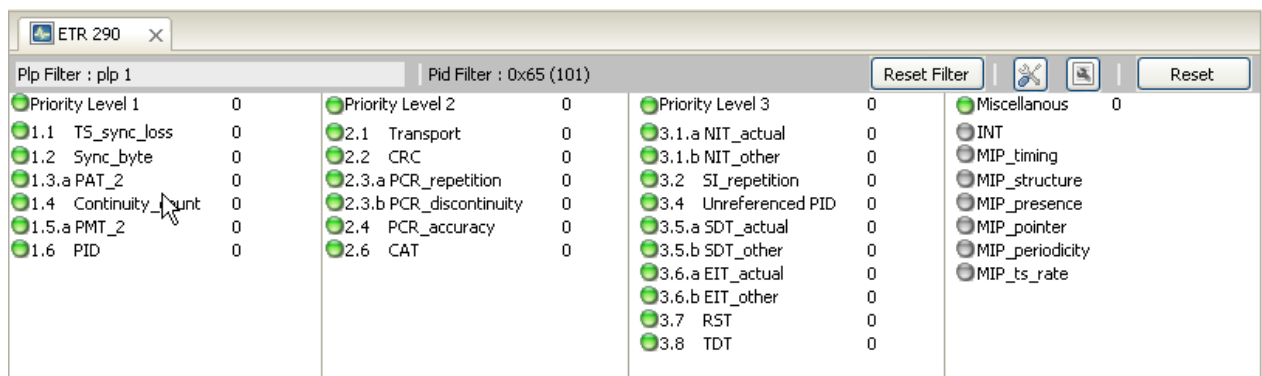
7.2 Monitoring views

TS Analyzer plugin includes:

- ETR 290 monitoring window
- PCR monitoring window
- Delay monitoring window (for ASI input streams)

7.2.1 ETR 290

The ETR 290 monitoring window display alarms for each enabled parameter on the whole stream content or specific part by PID or service filtering.



7.2.2 PCR

The PCR analysis monitoring window display PCR accuracy measurements on the whole stream content or specific part by PID or service filtering.

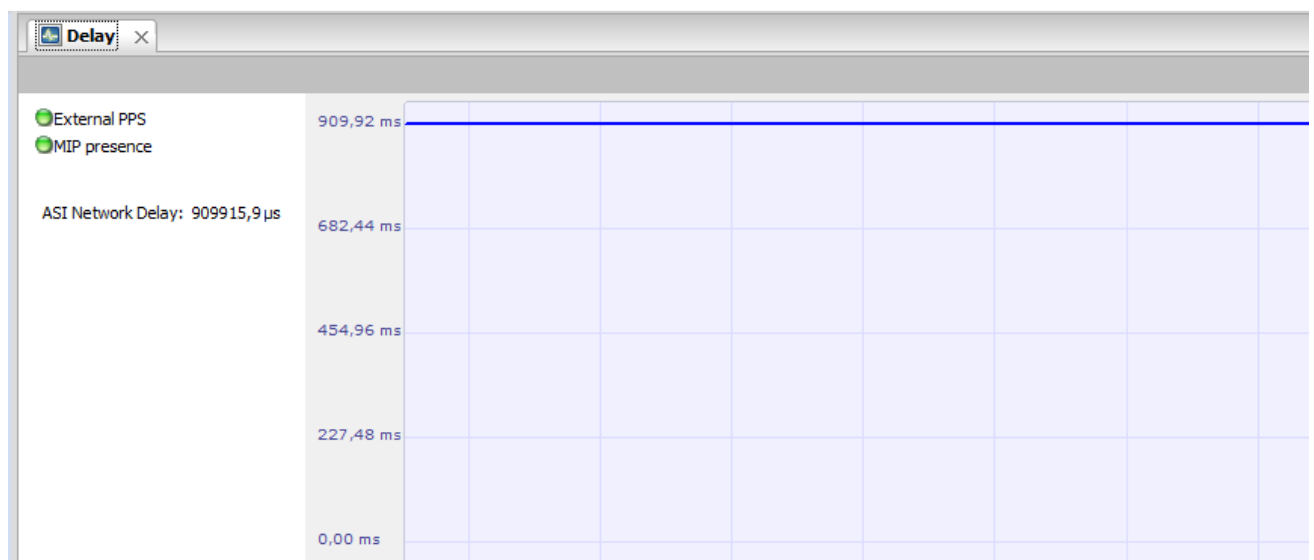
Accuracy values can be viewed by density of history by clicking on the "Display Density"/"Display History" button.

The   icons allow managing the zoom on the graph.



7.2.3 Delay

The Delay monitoring view is available for a DVB-T ASI analysis. The input stream must contain the MIP packet. The ASI Network Delay parameter is equivalent to the SFN delay analysis for a RF signal.



Please refer to appendix §13.1 for information regarding the SFN synchronization mechanism and measurements.

8 T2MI Analyzer plugin

T2-MI Analyzer plugin is the analysis tool for DVB-T2 Modulator Interface monitoring. It supports T2-MI Single and Multi-PLP streams. It allows real-time monitoring of DVB-T2 parameters and de multiplexing of PLP contents. These contents can then be analyzed in real-time with TS Analyzer plugin, decoded and displayed...

T2-MI monitoring features:

- T2 L1 pre/post signaling: frame, cells, OFDM symbols, # FEC, interleaving, TI block size
- PLP allocation: BB frame padding, TS padding, TS overflow
- BB frame, ISSY field, T2 timestamp

DiviSuite Base allows the reception of T2-MI streams even if the T2MI Analyzer plugin is not activated. In the absence of the T2MI Analyzer plugin, the different PLPs are not extracted nor analyzed. However, the corresponding MPEG-2 TS can be recorded.



T2MI

Analyzer

- T2 L1 pre/post signaling, PLP allocation (BB frame, TS, padding/overflow)
- T2 timestamp, BB frame, ISSY field
- Single & Multi-PLP, PLP extraction

8.1 Settings Panel

T2-MI analysis can be disabled through the setting panel. T2-MI streams are embedded in a MPEG-2 TS stream using data piping. Depending on the equipment delivering the T2-MI stream, the data piping PID can be extracted from PAT and PMT tables as a private data PID or PID identification can be manually entered. For using Auto extraction from PSI tables (PAT, PMT), TS Analyzer plugin is mandatory.

RF
Tables
Bitrate
ETR
290
T2-MI
GPS
Log
File
Report
File
Satel...
DiviS...

☒ Enable T2-MI analysis

Analysis settings

T2-MI Data Piping

Extract T2-MI from PID (in decimal)

☒ Auto extract from PSI tables

Alarm settings

Name	On	Log	Mode
Packet type	☐	☐	Continuous ▼
Packet payload	☐	☐	Continuous ▼
Packet count	☐	☐	Continuous ▼
CRC32	☐	☐	Continuous ▼
Payload	☐	☐	Continuous ▼
Timestamp	☐	☐	Continuous ▼
Timestamp disc	☐	☐	Continuous ▼
Plp Num blocks	☐	☐	Continuous ▼
Transmission order	☐	☐	Continuous ▼

8.2 Monitoring views

Monitoring windows include T2 L1 and T2-MI windows.

The T2-MI window display analysis of T2-MI encapsulation. It displays in real time bitrate for each conveyed PLP.

T2-MI x **T2 L1** x

Superframe duration : 0,247408 s Number of T2 frames per superFrame : 2

T2 Superframe :
Superframe Idx : 7

T2 frame composition

BB frames number : 62 Bitrate : 23,85 Mb/s
 Timestamp frames number : 1 Bitrate : 1,58 Kb/s
 L1 frames number : 1 Bitrate : 7,23 Kb/s

T2-timestamp
 Delta timestamp : 0,000000 s Emission time : N/A Bandwidth : 8 MHz

PLP		BaseBand Frame			
Plp Id	Name	Mode	Bitrate	Null packet deletion	TS Bitrate
0	plp 0	high efficiency	11,55 Mb/s	Off	11,39 Mb/s
1	plp 1	high efficiency	12,30 Mb/s	Off	11,38 Mb/s

T2-MI structure alarms
☐ Packet count
☐ CRC32
☐ Superframe Idx

T2-MI correlation alarms
☐ Timestamp

The T2-L1 window displays the L1 signaling of the DVB-T2 parameters which will be used by the modulator for generating the RF signal.

L1 current

L1-pre signalling

Frames / SuperFrames	2	FEC Frame	Short 16k	L1 Post Extension	OFF
OFDM Symbols	59	Code rate	1/2	L1 Post Info Size	455
Transmission System	SI50	Bandwidth Extension	OFF	L1 Post Size	902
L1 Post Constell	QPSK	Network Id	12385	L1 Repeat	OFF
P.A.P.R	None	System ID	32769	Number RF Frequencies	1
FFT	16K	Cell ID	24833	RF Index	0
Guard Interval	19/128	T2 Stream Type	TS	Regeneration Flag	0
Pilot Pattern	3			Reserved	[N/A]

L1 Post Signalling

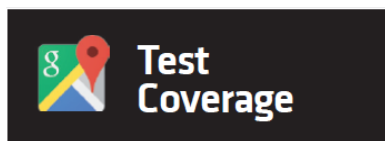
PLP Id	Group Id	PLP type	Constellation	Rotated	Code rate	FEC Type	TI Type	TI Length	Frame Interval	PLP num max blocks	Frequency	In-band signalling
0	1	Type1	256-QAM	Normal	2/3	Long 64k	Mode 0	1 TI blocks	1	30	N/A	OFF
1	1	Type1	16-QAM	Rotated	3/5	Long 64k	Mode 0	1 TI blocks	1	32	N/A	OFF

9 Test Coverage plugin

Test Coverage plugin can be used only by the DiviSuite application connected to a ReFeree II device.

Test Coverage plugin allows to activate the embedded GPS receiver in order to generate test report files (KML, readable with Google Earth). These files contain the measured values for the configured parameters as well as the localization information (GPS/Glonass).

The plugin is delivered with a magnet GPS L1 Antenna.



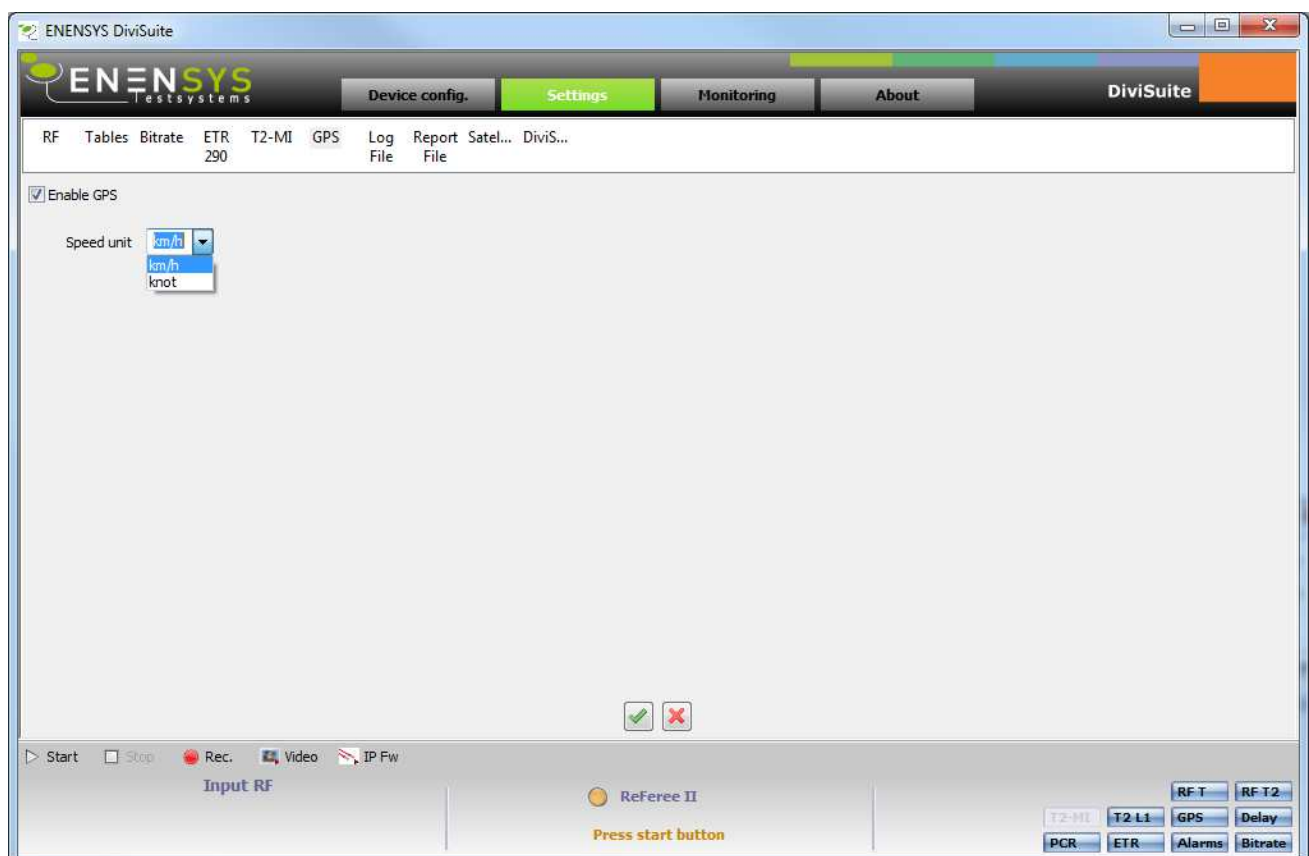
- GPS Receiver (GPS/Glonass)
- Test Reports (Google Earth compliant)

9.1 Settings Panel

Two Settings panels are available for the Test Coverage plugin functionalities to be configured: GPS and Report File.

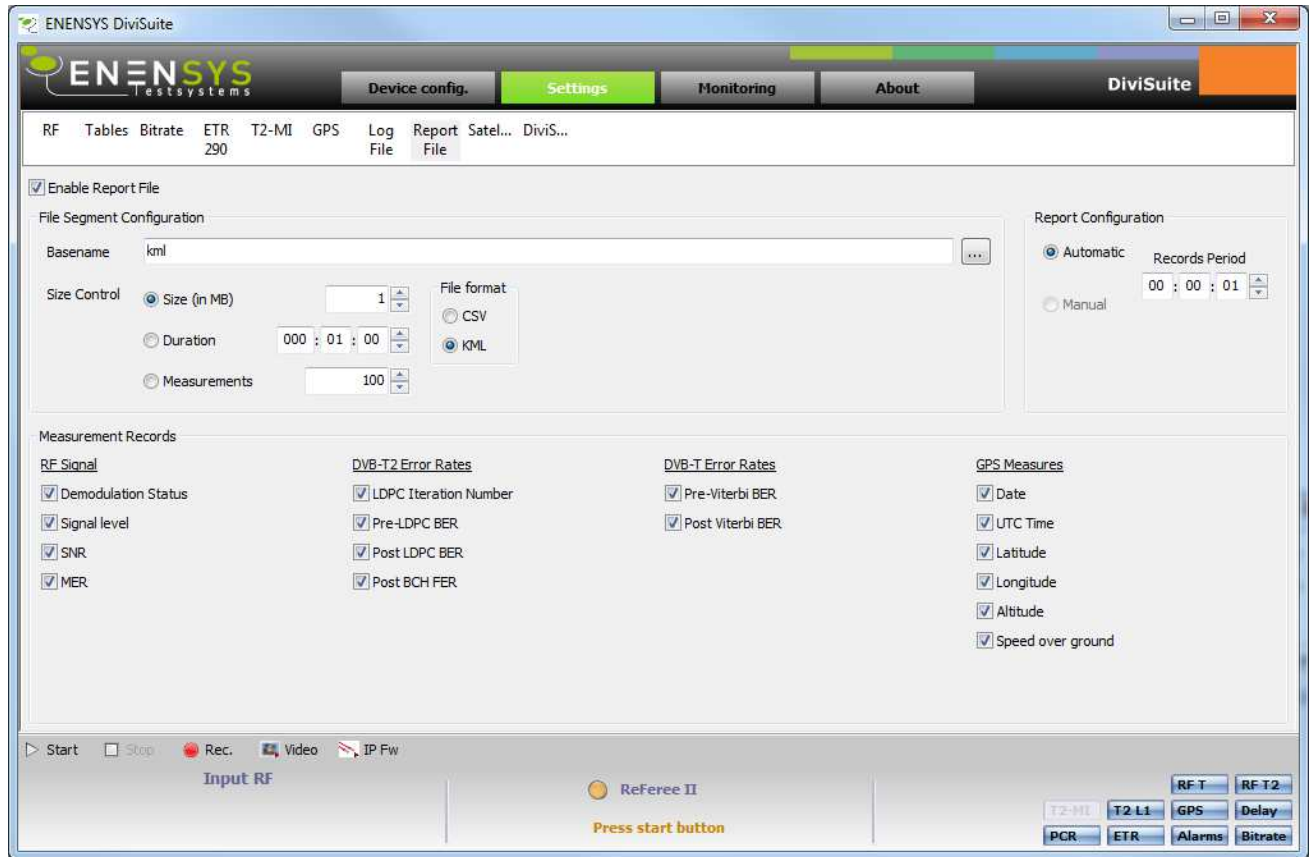
9.1.1 GPS

In the GPS panel, the GPS functionality can be enabled and the speed unit chosen.



9.1.2 Report File

In the Report File panel, the Report File functionality has to be enabled and the File format must be KML.



9.1.2.1 File Segment

Report File feature allows creating multiple files for the measurement sessions. These files are named segment file. Each segment size can be controlled by the user by setting:

- The maximum segment size in Mega Bytes
- Or the maximum segment time duration
- Or the maximum number of measurements in the segment

Each segment will be named with the following rule:

- Use destination directory of the Basename field
- Use the file basename with `_ {ID}` suffix, where `{ID}` is the segment number
- Use file extension of the Basename

The screenshot below will lead to creating `c:\report-coverage_1.kml`, `c:\report-coverage_2.kml`, ... files with a size of 1MB.

Please note that if segment files already exist with the same rule, they will not be overwritten. Numbering will start at the next available index.

9.1.2.2 Report

The Record Period field allows setting the periodicity of the measurements, with a minimum of 1 second.

9.1.2.3 Measurement

The parameters to be measured can be set among the RF Signal, DVB-T2 Error Rates, DVB-T Error Rates and GPS Measures.

9.2 GPS Report File in Google Earth application

The KML report file obtained after a GPS coverage test, can be viewed using the Google Earth application:

- In data format:

Test GPS Data V2
Imported at Thu Jun 26 23:04:25 PDT 2014 from Test GPS Data V2.xlsx
Exported on June 27, 2014

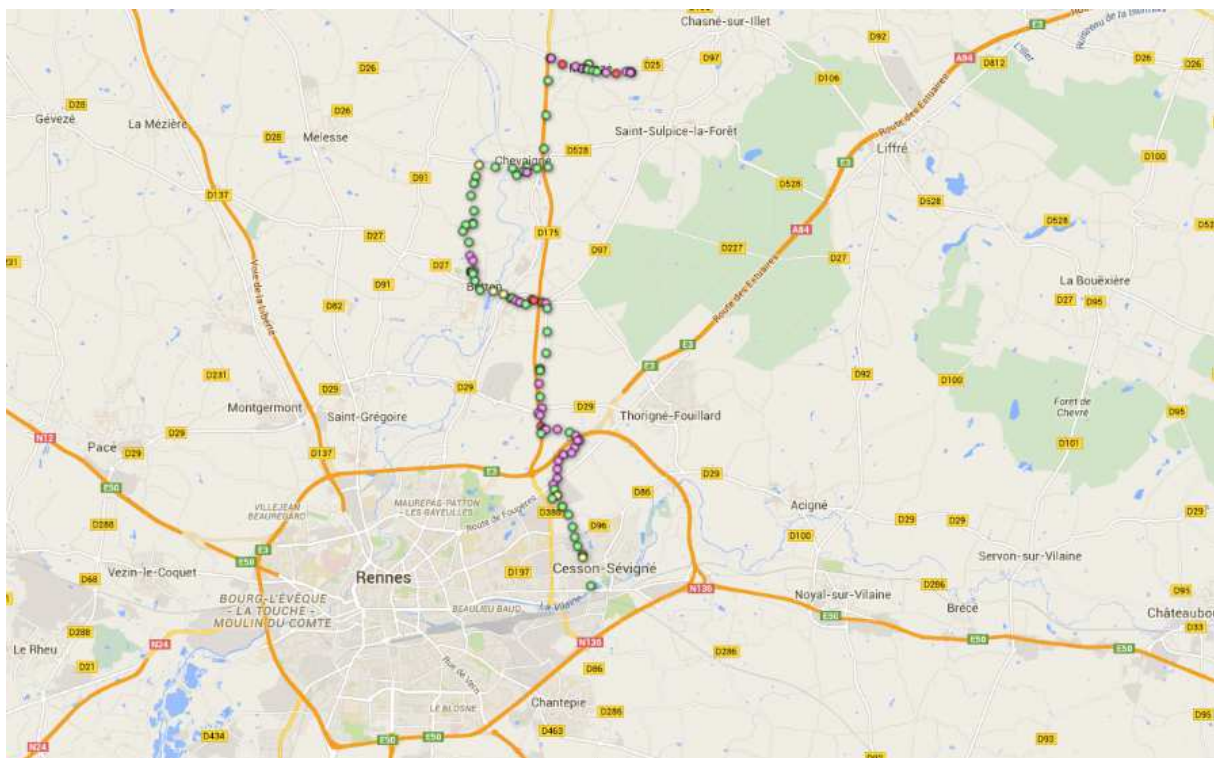
File Edit Tools Help Rows 1 Cards 1 Map 1

Filter No filters applied

1-100 of 221

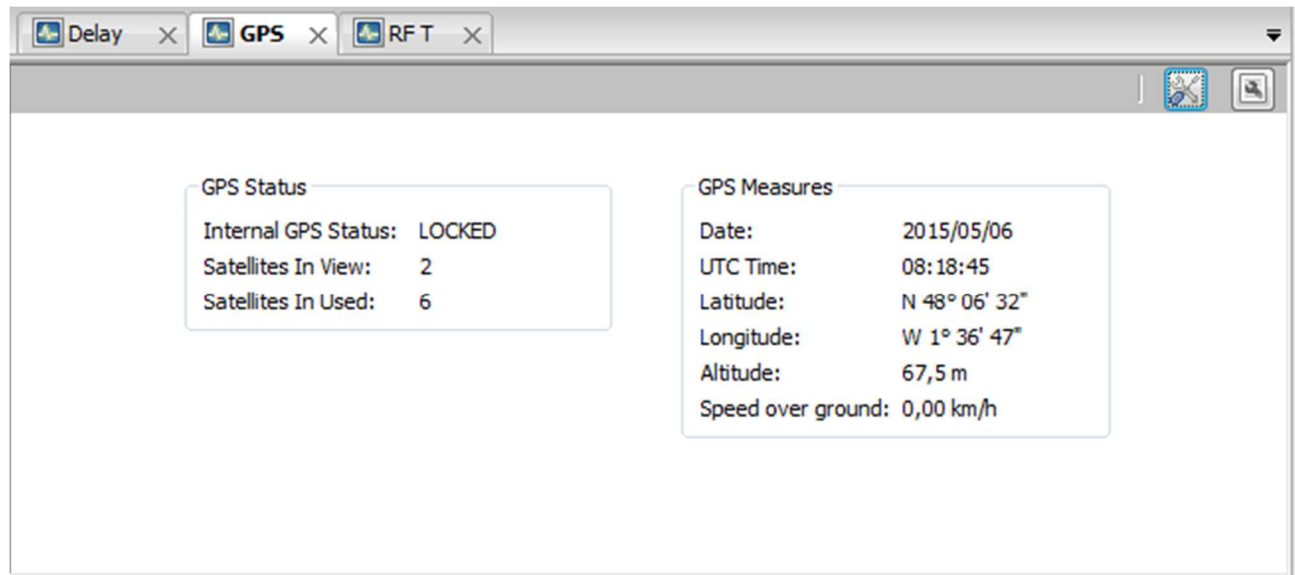
DateTime	GPS Date	UTC time	North	Latitude	West	Longitude	Altitude (m)	Speed (km/h)	Lock status	Signal lev...	SNR (dB)	MER (dB)	col13	col14
5/16/14 18:53	2014/06/16	16:50:02	N 480 08' 6219"	48.1153850	W 10 38' 4600"	-1.6076667	29.11	19.26	1	-88.2	9.2	10.2	6.40E-02	3.90E-02
5/16/14 18:54	2014/06/16	16:50:32	N 480 07' 3185"	48.1219417	W 10 38' 6226"	-1.6103767	61.34	23.52	1	-81.2	13.4	9.4	7.30E-02	3.40E-02
5/16/14 18:54	2014/06/16	16:51:02	N 480 07' 3296"	48.1221600	W 10 38' 6280"	-1.6104467	51.09	0	1	-79.5	15.6	15.6	5.40E-02	1.00E-02
5/16/14 18:55	2014/06/16	16:51:32	N 480 07' 3494"	48.1224600	W 10 38' 6405"	-1.6106750	45.91	26.48	1	-71.9	20.5	11.6	4.60E-02	2.80E-02
5/16/14 18:56	2014/06/16	16:52:02	N 480 07' 4654"	48.1244233	W 10 38' 7356"	-1.6122583	41.72	33.71	1	-78.9	12	10.9	7.30E-02	2.20E-02
5/16/14 18:56	2014/06/16	16:52:32	N 480 07' 5913"	48.1265217	W 10 38' 7940"	-1.6132333	41.94	32.78	1	-69.5	23.3	10.2	5.70E-02	3.70E-02
5/16/14 18:56	2014/06/16	16:53:02	N 480 07' 7253"	48.1288050	W 10 38' 8414"	-1.6140233	49.81	37.04	1	-77.9	12.8	10.6	6.00E-02	2.10E-02
5/16/14 18:57	2014/06/16	16:53:32	N 480 07' 8886"	48.1314767	W 10 38' 9150"	-1.6152500	51.18	48.34	1	-75.3	16	12.7	4.90E-02	1.70E-02
5/16/14 18:57	2014/06/16	16:54:02	N 480 07' 9653"	48.1322550	W 10 37' 0386"	-1.6173100	54.91	9.63	1	-77.2	15.5	10.6	7.80E-02	3.90E-02
5/16/14 18:58	2014/06/16	16:54:32	N 480 08' 0006"	48.1333483	W 10 37' 0538"	-1.6175933	54.14	22.04	1	-72	21.9	12.6	4.90E-02	3.50E-02
5/16/14 18:58	2014/06/16	16:55:02	N 480 08' 1036"	48.1350633	W 10 37' 2442"	-1.6207367	66.94	19.08	1	-70.8	19.2	14.7	3.30E-02	5.40E-03
5/16/14 18:59	2014/06/16	16:55:32	N 480 08' 1514"	48.1358567	W 10 37' 1511"	-1.6191850	66.63	0	1	-77.2	15.4	9.4	7.00E-02	3.90E-02
5/16/14 18:59	2014/06/16	16:56:02	N 480 08' 1517"	48.1358617	W 10 37' 1503"	-1.6191717	70.72	0	1	-77.5	16	11	6.70E-02	3.80E-02
5/16/14 19:00	2014/06/16	16:56:32	N 480 08' 1537"	48.1358550	W 10 37' 1497"	-1.6191617	70.76	6.11	1	-75	14	12.4	5.40E-02	1.20E-02
5/16/14 19:00	2014/06/16	16:57:02	N 480 08' 2330"	48.1372167	W 10 37' 2170"	-1.6202983	62.12	23.89	1	-74.8	18	11.5	5.70E-02	2.60E-02
5/16/14 19:01	2014/06/16	16:57:32	N 480 08' 2972"	48.1382867	W 10 37' 2356"	-1.6205933	71.03	21.86	1	-51.4	31	29.4	3.60E-05	6.00E-07
5/16/14 19:01	2014/06/16	16:58:02	N 480 08' 3796"	48.1396433	W 10 37' 1520"	-1.6192000	66.79	28.71	1	-57.7	31	25.3	3.50E-03	6.00E-05
5/16/14 19:02	2014/06/16	16:58:32	N 480 08' 5136"	48.1418663	W 10 37' 1388"	-1.6198600	64.18	31.3	1	-51	29.4	25.3	3.00E-03	4.70E-04
5/16/14 19:02	2014/06/16	16:59:02	N 480 08' 6171"	48.1436183	W 10 37' 1260"	-1.6188167	60.2	23.71	1	-60.7	21.6	21.6	4.50E-03	1.00E-04
5/16/14 19:03	2014/06/16	16:59:32	N 480 08' 6669"	48.1449483	W 10 37' 0333"	-1.6172217	62.49	28.89	1	-56.9	27.9	22	5.30E-03	1.90E-06
5/16/14 19:03	2014/06/16	17:00:02	N 480 08' 7266"	48.1454467	W 10 38' 8528"	-1.6142133	62.5	25.56	1	-64.3	26.4	21.9	5.60E-03	3.40E-06

- Or map format:



9.3 Test Coverage Monitoring View

The Monitoring window GPS displays in real time the GPS status and measures.



10 Equipment return for repair

In case of any trouble with one of ENENSYS TESTSYSTEMS' products, please report it to our Technical Support team via email (support@enensystest.com). Your request should specify Part Number and Serial Number as displayed on the bottom label of the equipment, with a description of the defect, reference of Purchase Order if possible, and your full details.

Upon receiving your request, a support engineer will get in touch with you in order to surely identify the source of your problem. If equipment has to be returned for repair, a RMA⁴ number will be provided to you. You will need to indicate it on the shipping box of the faulty equipment, and/or add it in your communication with our support team. Your equipment will be shipped back to you along with a repair report.

⁴ Returned Material Authorization

11 Upgrades and Privileged Area

A Privileged Area (<http://privileged.enensys.com>) is available on ENENSYS TESTSYSTEMS' website. Any registered user has access to the Privileged Area where general documentation, User Manual, software and product upgrades can be downloaded.

In order to get access to the Privileged Area, you will have to register on your first access. A valid serial number must be provided. You will then receive a password that will give you access to the Privileged Area.

12 Contact Information

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13 Appendix

13.1 SFN synchronization measurement

SFN operation requires precise signal synchronization between all the transmitters of each SFN cell. SFN problems are usually caused by a temporal shift in the DVB-T or DVB-T2 frame actual transmission time compared to other transmitters in the other SFN cells.

The most common origins of these SFN synchronization problems are:

- A defect in the transport stream feeding the transmitter.
- Faults in the transmitter distribution network. With many devices between the T2Gateway (DVB-T2) or MIP Inserter (DVB-T) and the transmitters, both equipment and network failures (faults) could introduce time shifts into the stream. SFN errors might occur if these time shifts exceed the maximum network delay.
- A modulator that has errors or faults in time synchronization, usually caused by problems with the time reference such as GPS signal. These errors would cause a temporal shift in the transmission compared to the reference.
- Modulator loss of synchronization with the transport stream feed to the transmitter (the case of buffer underflow or buffer overflow).
- Modulator frequency drift. If the center frequency were to drift, due to a fault or some other cause, after some time (usually a few hours) the frequency drift of the modulator will cause a temporal shift of the transmission time of the DVB-T or DVB-T2 frame.
- Defective DVB-T/T2 transmitter.
- Faulty GPS receiver.

13.1.1 DVB-T SFN measurement

For a DVB-T system, the SFN synchronization is achieved by inserting a MIP (Mega-frame Initialization Packet) packet in each mega-frame. The MIP_N carries a STP (Synchronization Time Stamp) value, which indicates the starting point of the first packet of the mega-frame N+1; starting point computed as the difference between the latest pulse of the "one-pulse-per-second" (1PPS) reference and the actual start time⁵.

This synchronization mechanism is specified by the [ETSI TS 101 191](#) document. Please refer to this technical specification document for details.

The DiviSuite SFN measurement for a DVB-T system indicates the following parameters:

- External **PPS presence**: 1PPS signal required as the STS value depends of the pulse of the "one-pulse-per-second" reference.
- **MIP presence**.
- **SFN Delay**: time to receive the mega-frame, see Figure 1:

$$\text{SFN Delay} = [T_{\text{rec mega-frame N}} - \text{STS}_{\text{mega-frame N (from MIP}_{N-1})}]$$

⁵ [ETSI TS 101 191](#)

- **SFN Drift:** variation of the SFN Delay.

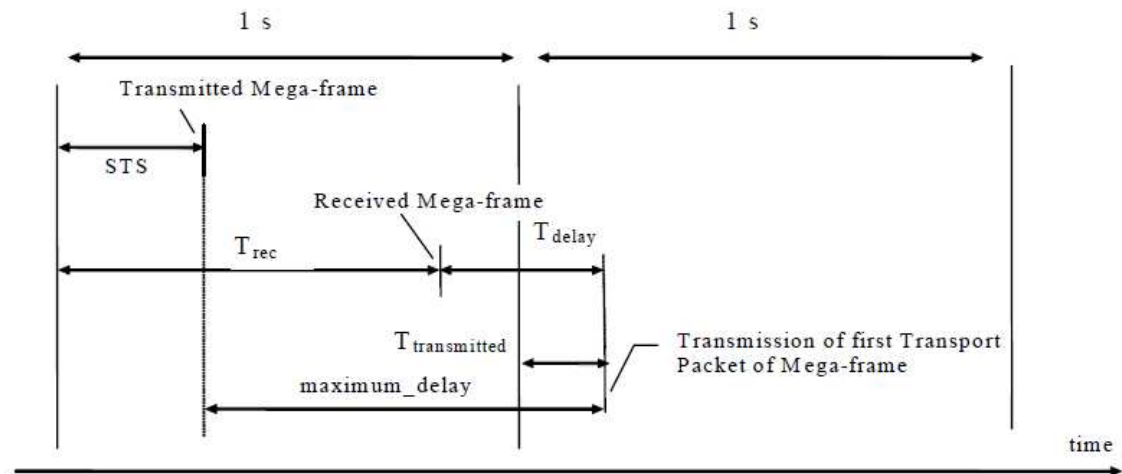


Figure 1 Functional description of the SFN synchronization⁶

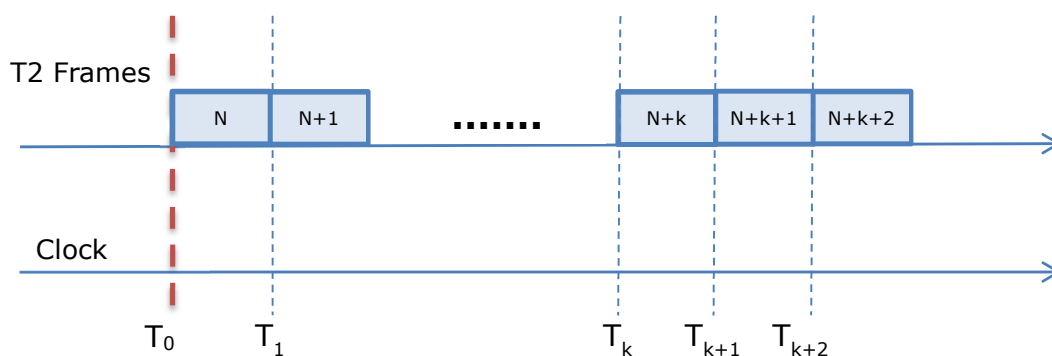
13.1.2 DVB-T2 SFN measurement

For SFN synchronization in a DVB-T2 system, the T2-MIP packet is used by a retransmission site to create a SFN cell on a frequency f_0 from a DVB-T2 RF signal received on a frequency f_1 . The timestamp carried by the T2-MIP provides time synchronization for the repeater (frequency f_0), not for the transmitter (frequency f_1).

The T2-MIP packet does not have a deterministic position in the transport stream; its position depends on the T2 Gateway implementation.

The SFN Drift cannot be computed using the T2-MIP packet.

The ENENSYS solution for SFN monitoring in DVB-T2 consists in computing the T2-Frame Drift.



If a T2-Frame is received at time T_0 , then arrival time of next T2-Frame will be T_0 incremented by the duration of a T2-Frame, which is known.

The T2-Frame algorithm:

⁶ [ETSI TS 101 191](#)

- At startup of the SFN Drift process, gets the reception date T_0 (from a real-time clock) of T2-Frame N and permanently store it. This value represents the reference time. Each reception date of a T2-Frame can be computed as follows:

$$T_k = T_0 + k * \text{Duration}_{\text{frame}}; k \in \mathbb{N}$$

- When a new T2-Frame is received, the reception time t can be expressed as:

$$t = T_0 + m * \text{Duration}_{\text{frame}} + \delta_t$$

$$m \in \mathbb{N}; \delta_t \in \mathbb{R} \text{ and } \delta_t < \text{Duration}_{\text{frame}}$$

δ_t is the sum between the uncertainty of the measurement and potential error on SFN synchronization. δ_t is the SFN drift value.

- The SFN Drift to monitor is then expressed as:

$\text{SFN}_{\text{drift}} = \text{Modulo} [(t - T_0) / \text{Duration}_{\text{frame}}]$
--

The DiviSuite SFN measurement for a DVB-T2 system indicates the following parameters:

- External **PPS presence**: 1PPS signal for synchronization, time reference.
- **TS lock** status.
- **T2-Frame Drift**: the difference between the T2-Frame real reception time t and the theoretical reception time T_k .
- **Reference time**: a T_0 reception time of the first T2-Frame considered as a reference.